SCHILLER

CARDIOVIT AT-6

SERVICE MANUAL

SCHILLER AG
Altgasse 68
CH-6340 BAAR / Switzerland

Telephone: 042 / 33 43 53
Telex: 865 140 sbe ch
Telefax: 042 / 31 08 80

Art. No: 2.530018
Issue: 26.1991

General Remarks

The CARDIOVIT AT-6 is constructed modularly. This means that in case of defect, each part, each board is replaced as a complete unit. The defective boards are then repaired by the manufacturer.

The few exceptions from this rule are described in this manual together with the necessary settings and adjustments. This work should only be carried out by competent, authorized technicians. The manufacturer declines any responsibility for inadequate repairs.

Allgemeine Hinweise

Der CARDIOVIT AT-6 ist modular aufgebaut, d.h. jeder Teil, jedes Board wird bei Defekt als ganze Einheit ersetzt. Die fehlerhaften Boards werden dann vom Hersteller repariert.

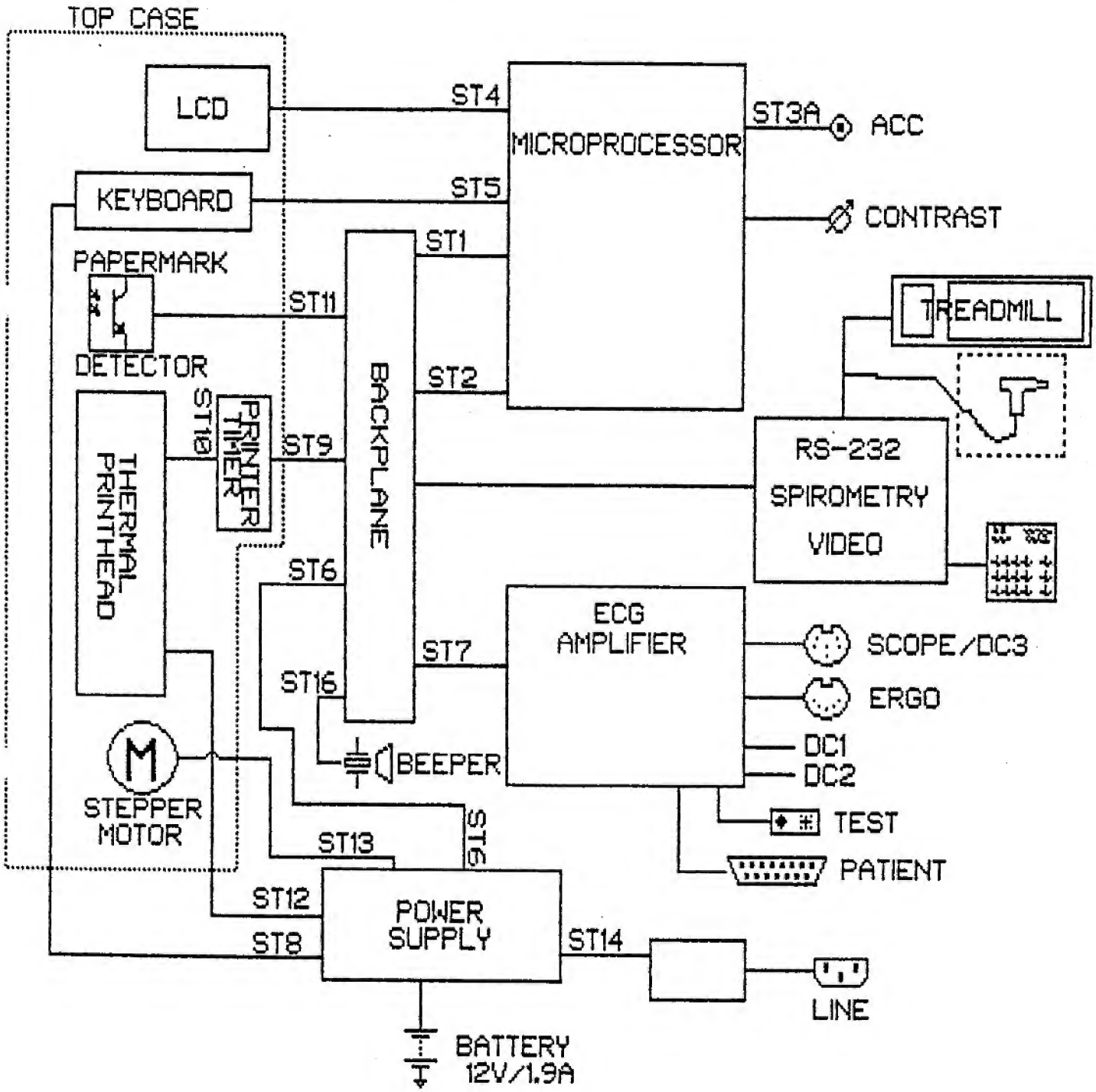
Die wenigen Ausnahmen von dieser Regel sind im vorliegenden Handbuch zusammen mit den notwendigen Einstell- und Abgleicharbeiten eingehend beschrieben. Diese Arbeiten sollten nur von befähigten, autorisierten Technikern ausgeführt werden. Für unsachgemässe Reparaturen lehnt der Hersteller jede Haftung ab.

SECTION 1

BLOCK SCHEMATIC

	Drawing No.
Block Diagram AT-6	-

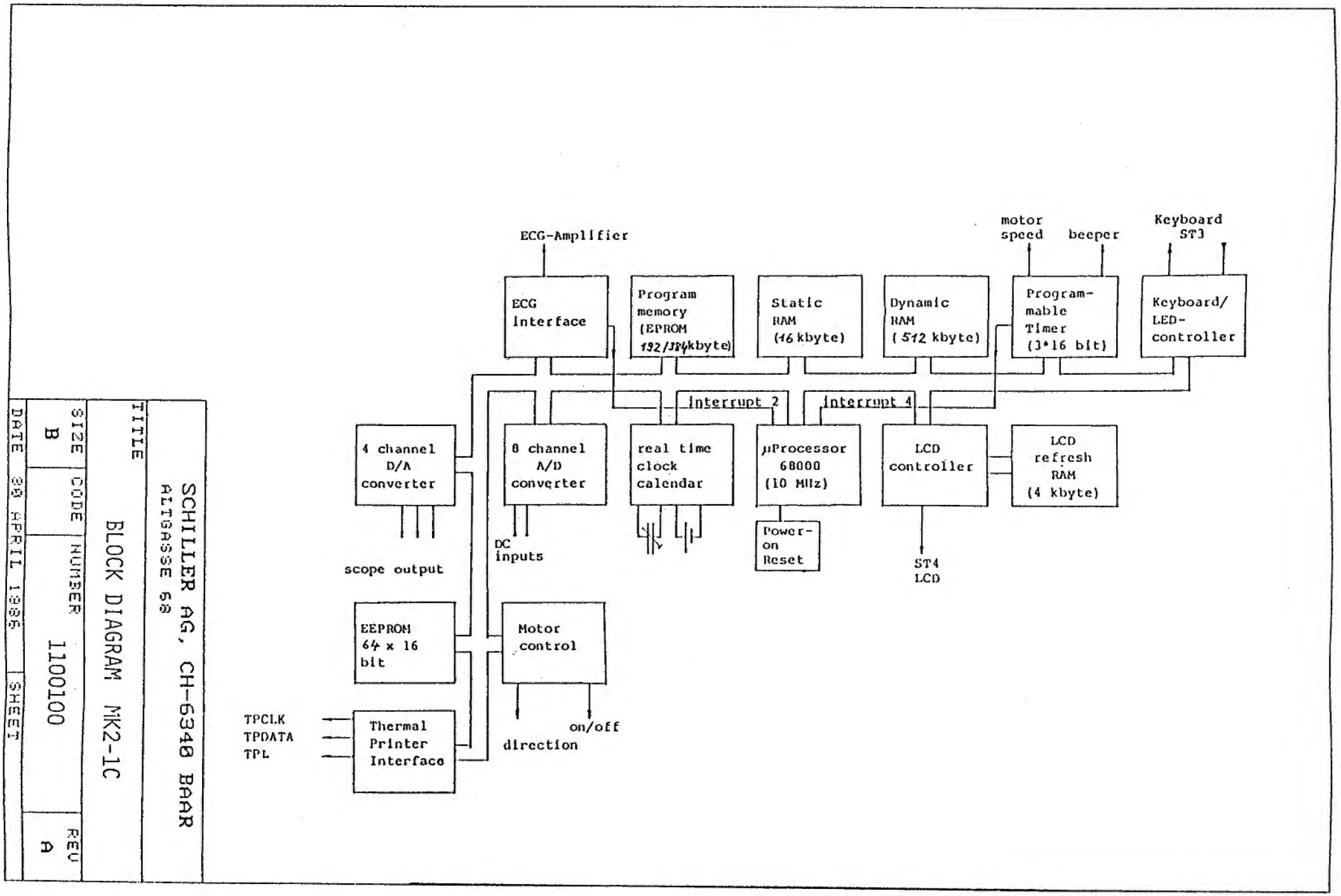
AT-6 BLOCK

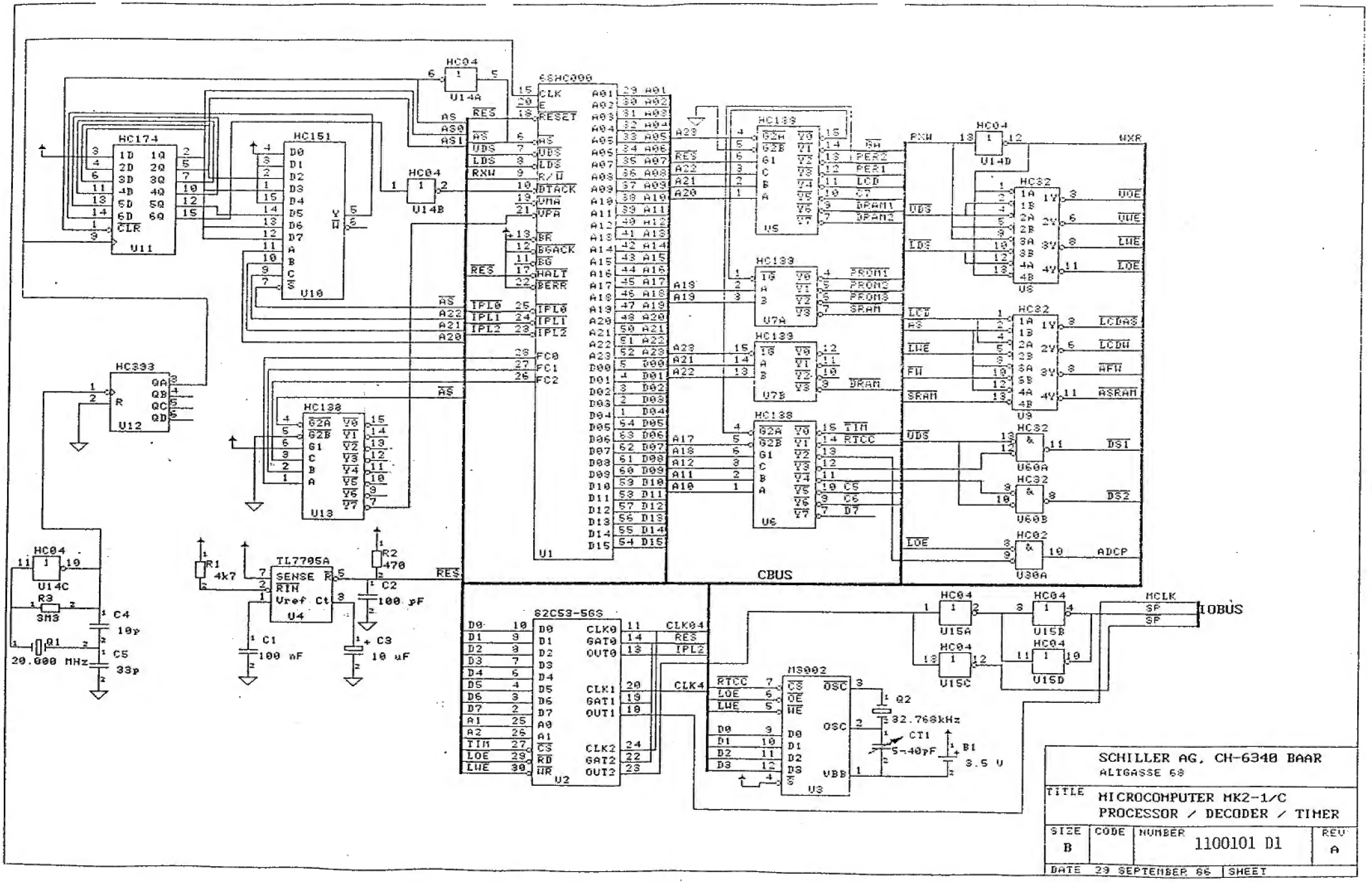

TOP CASE
LCD
ST4
MICROPROCESSOR
ST3A
ACC
KEYBOARD
ST5
CONTRAST
PAPERMARK
ST1
TREADMILL
ST11
DETECTOR
BACKPLANE
ST2
THERMAL PRINTHEAD
ST10
PRINTER TIMER
ST9
RS-232
SPIROMETRY
VIDEO
ST6
ECG AMPLIFIER
ST7
SCOPE/DC3
ST16
ERGO
DC1
DC2
BEEPER
STEPPER MOTOR
TEST
ST13
ST15
PATIENT
ST12
POWER SUPPLY
ST14
ST8
LINE
BATTERY
12V/1.9A

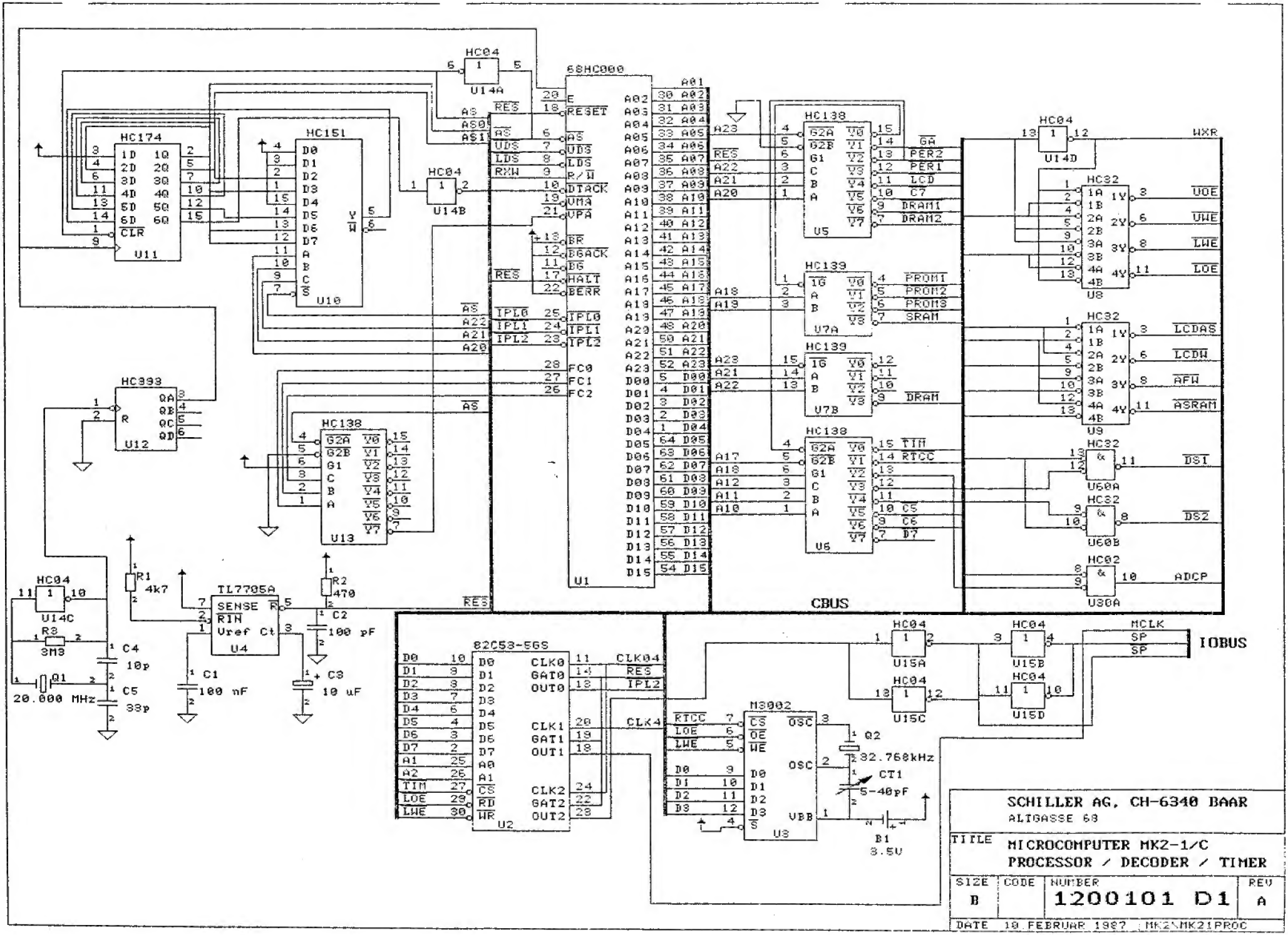
SECTION 2

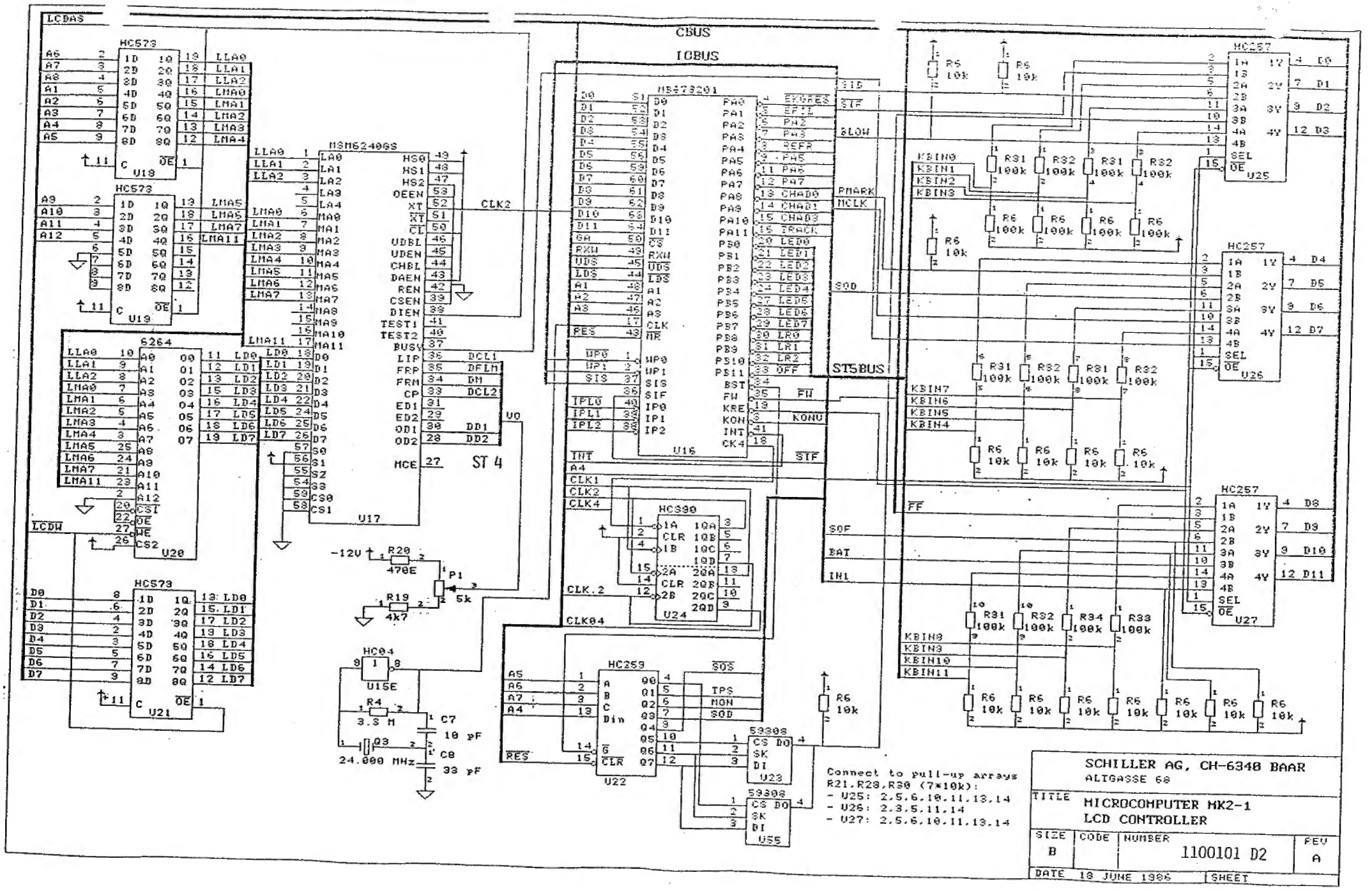
MICROPROCESSOR CIRCUITS MK2-1

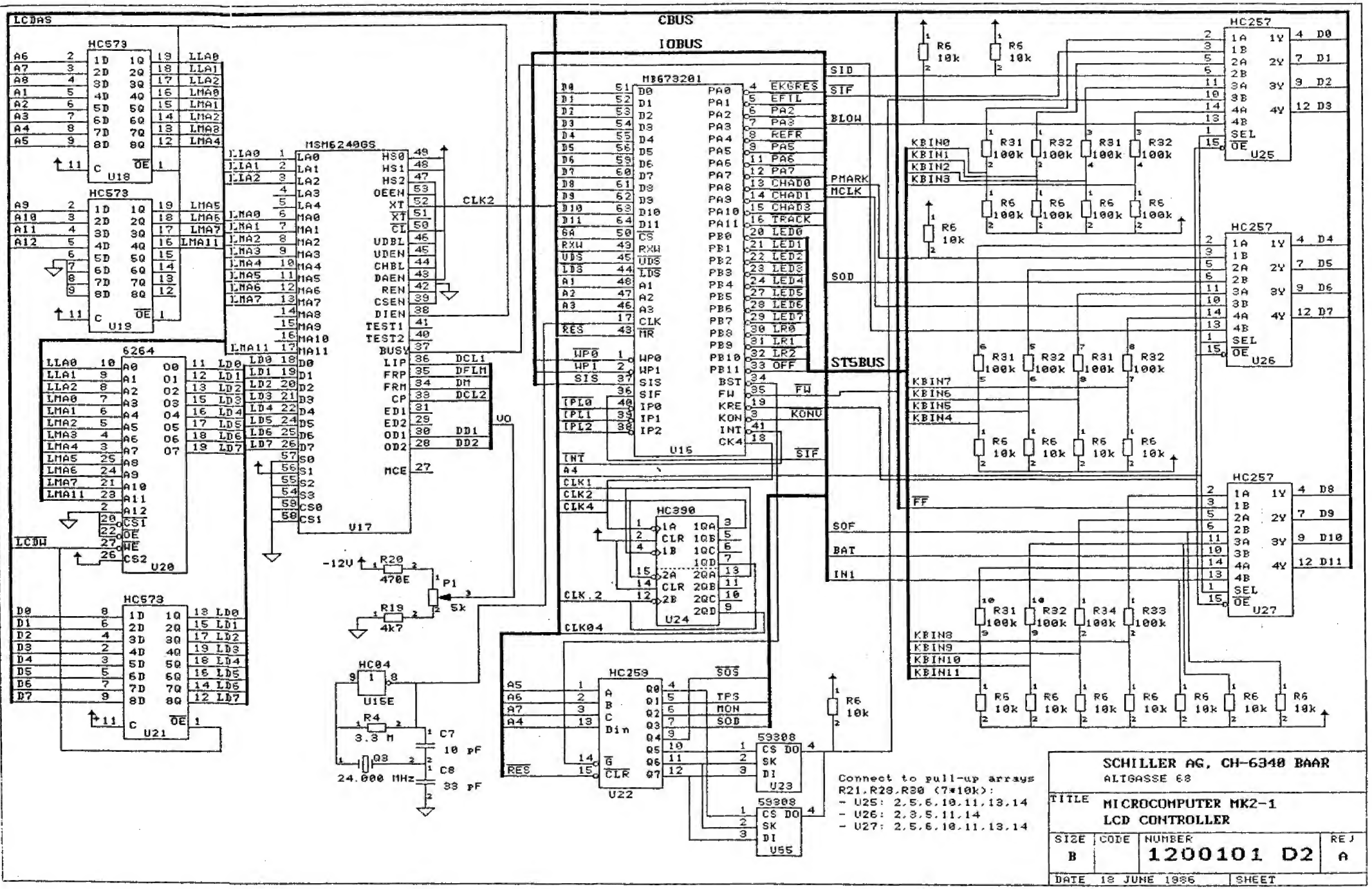
	Drawing No.
Block Diagram MK2-1C	1100100
Microprocessor/Decoder/Timer	1100101 D1 / 1200101 D1
Microprocessor/LCD Controller	1100101 D2 / 1200101 D2
Microprocessor MK2-1C Memory	1100101 D3 / 1200101 D3
Microprocessor MK2-1D Memory 2	1200101
Microprocessor MK2-1C Analog Output/Input	1100101 D4 / 1200101 D4
Microprocessor TP Controller	1100101 D5
Microprocessor ST-1 Connector	1100101 D6 / 1200101 D6
Microprocessor ST-2 Connector	1100101 D7 / 1200101 D7
Data I/O Connector ST-3a/ST-4	1100101 D8 / 1200101 D8
Microprocessor PCB Layout	1100103
Keyboard MK2-3	1100301 B1
Keyboard Connector ST-5 Pinout	1100101 D9 / 1200101 D9
Microcomputer MK2-1E Disposition	-
Technical Information	-

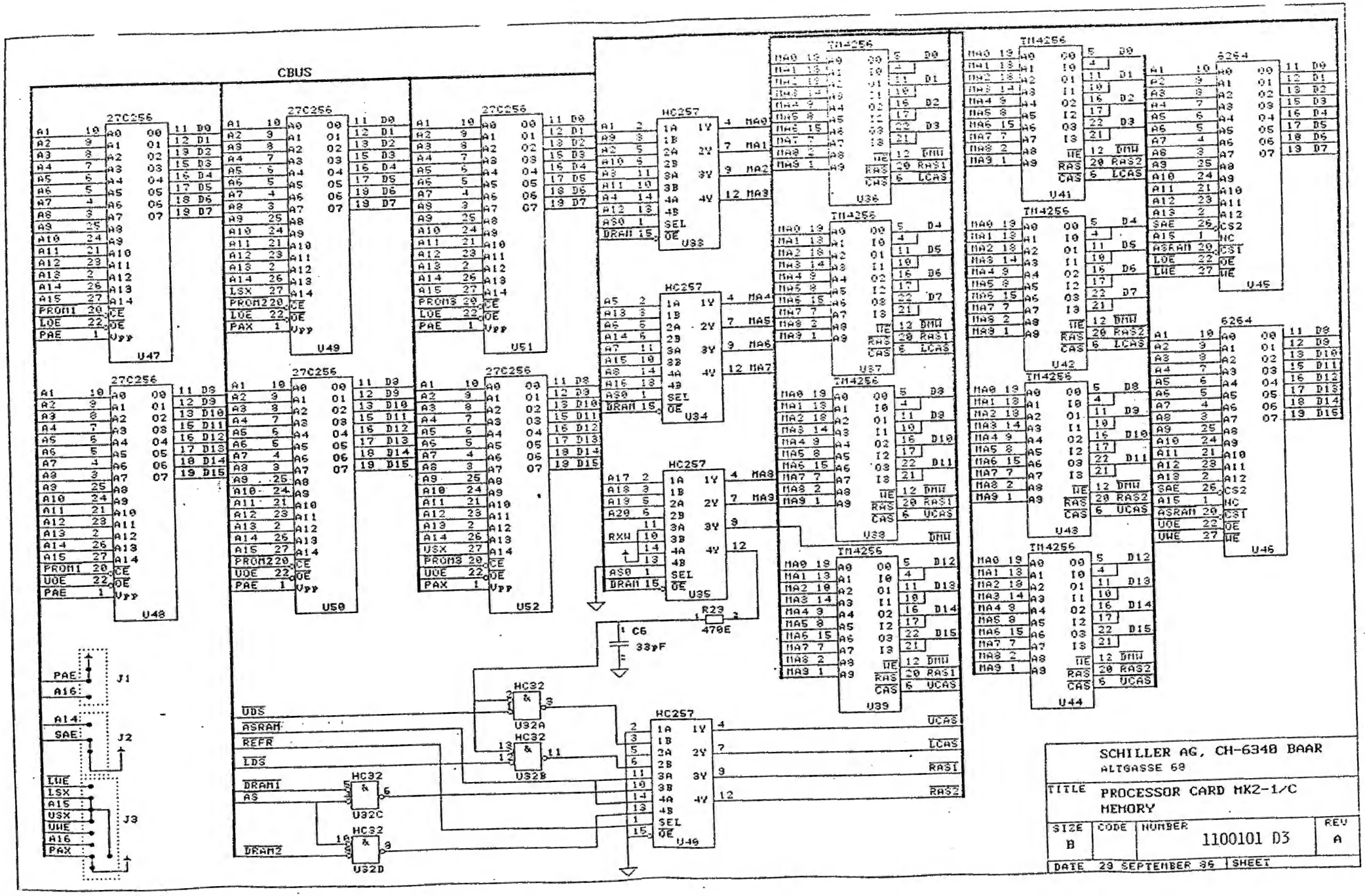

ECG-Amplifier
motor speed
beeper
Keyboard ST3
ECG Interface
Program memory (EPROM 192/384kbyte)
Static RAM (16 kbyte)
Dynamic RAM (512 kbyte)
Program-mable Timer (3*16 bit)
Keyboard/ LED-controller
Interrupt 2
Interrupt 4
4 channel D/A converter
8 channel A/D converter
real time clock calendar
µProcessor 68000 (10 MHz)
LCD controller
LCD refresh RAM (4 kbyte)
scope output
DC inputs
Power-on Reset
ST4 LCD
EEPROM 64 x 16 bit
Motor control
TPCLK
TPDATA
TPL
Thermal Printer Interface
on/off
direction
SCHILLER AG, CH-6340 BAAR
ALTGASSE 68
TITLE
BLOCK DIAGRAM MK2-1C
SIZE B
CODE
NUMBER 1100100
REV A
DATE 30 APRIL 1986
SHEET

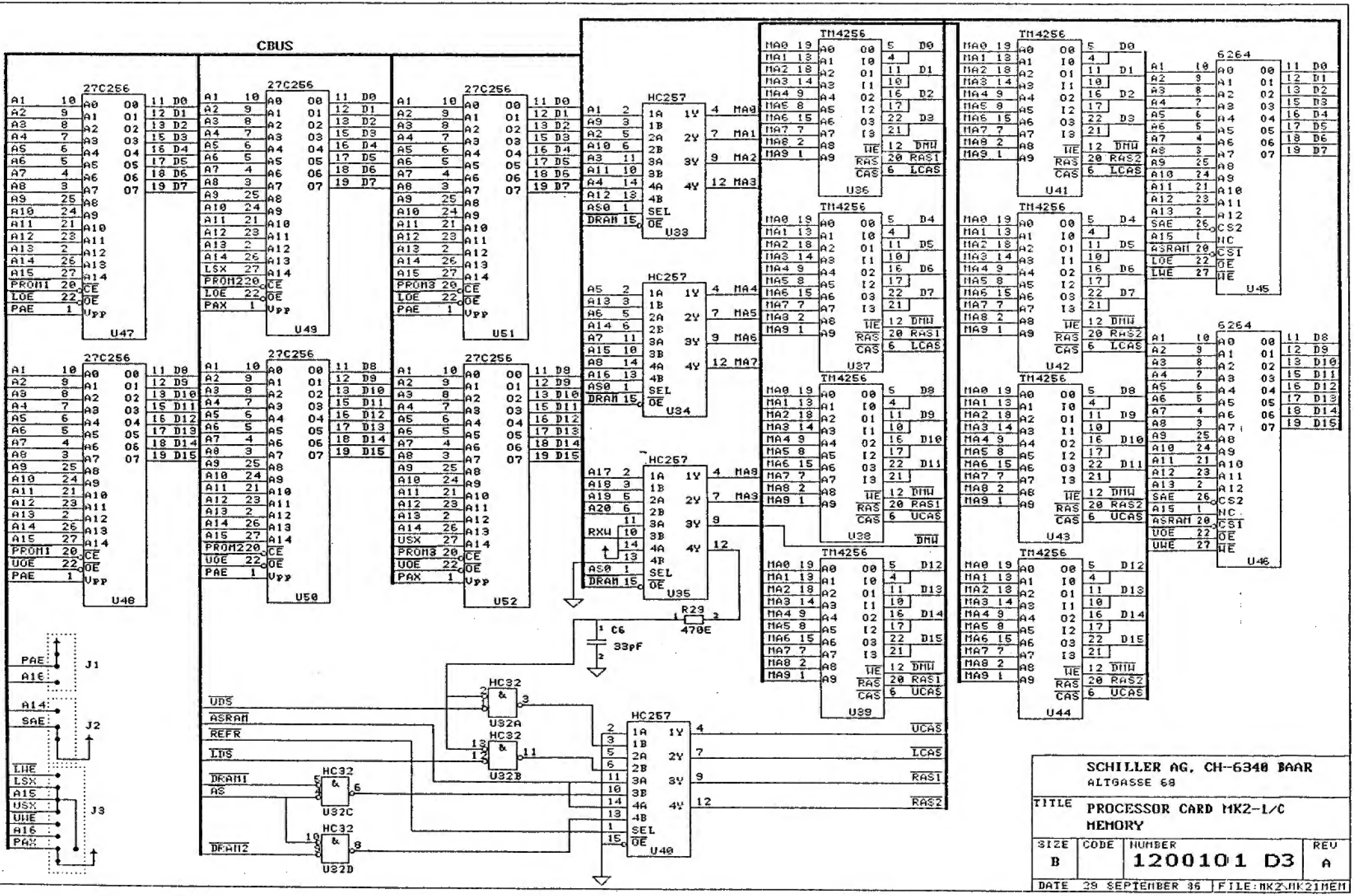

SCHILLER AG, CH-6340 BAAR
ALTGASSE 68
TITLE
MICROCOMPUTER MK2-1/C
PROCESSOR / DECODER / TIMER
SIZE B
CODE
NUMBER 1100101 D1
REV A
DATE 29 SEPTEMBER 86
SHEET
CBUS
IOBUS
68HC000
HC174
HC151
HC04
HC393
HC138
HC139
HC32
TL7705A
82C53-5GS
MS002
20.000 MHz
32.768kHz
3.5 V

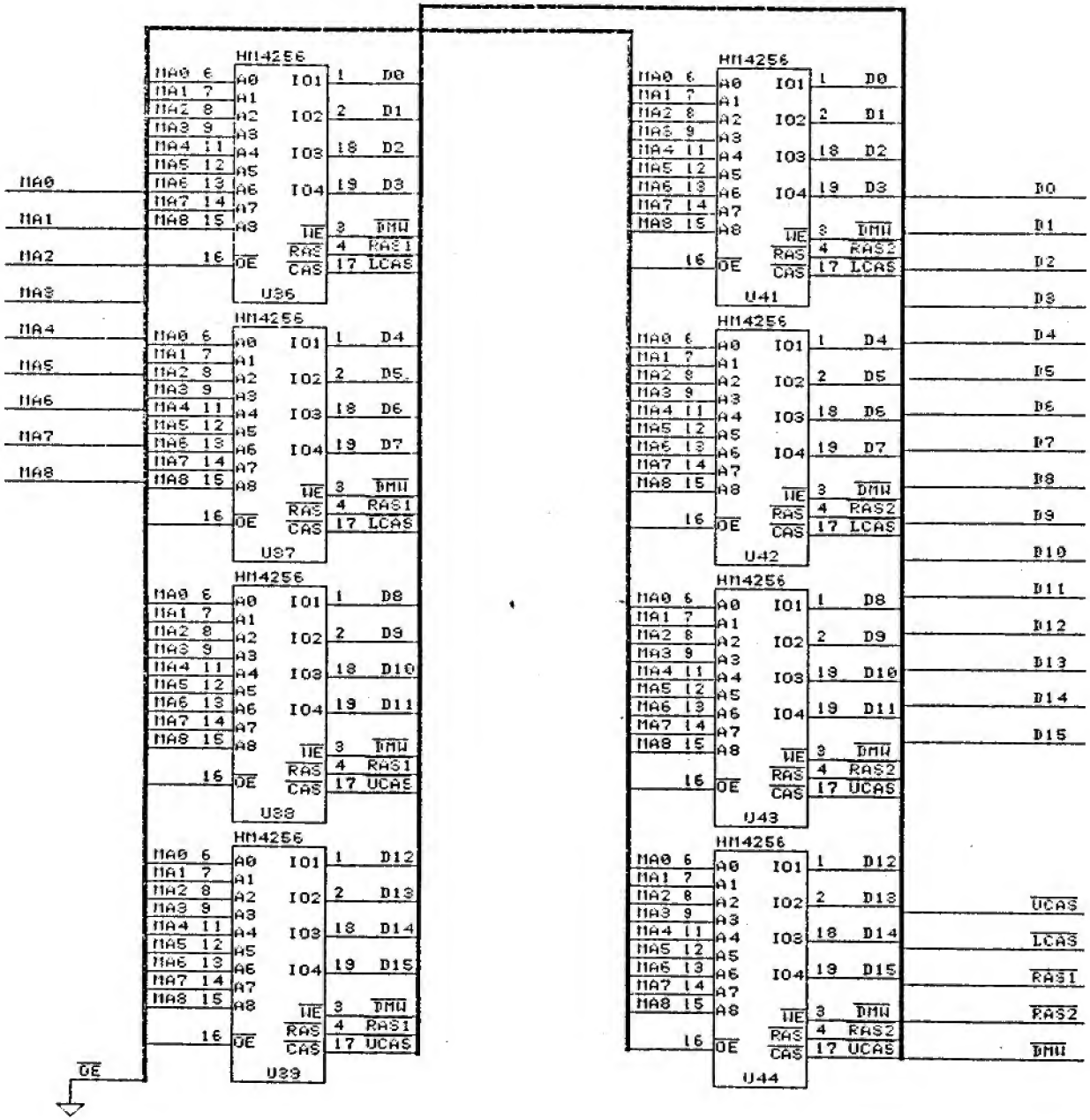

HC04
U14A
68HC000
HC174
U11
HC151
U10
HC04
U14B
HC393
U12
HC138
U13
HC04
U14C
R1
4k7
R2
470
TL7705A
U4
C1
100 nF
C2
100 pF
C3
10 uF
C4
10p
C5
33p
Q1
20.000 MHz
R3
3M3
82C53-5S
U2
M3002
U3
Q2
32.768kHz
CT1
5-40pF
B1
3.5V
HC138
U5
HC139
U7A
U7B
U6
HC04
U14D
HC32
U8
U9
U60A
U60B
HC02
U30A
HC04
U15A
U15B
U15C
U15D
MCLK
IOBUS
CBUS
SCHILLER AG, CH-6340 BAAR
ALTGASSE 68
TITLE
MICROCOMPUTER MK2-1/C
PROCESSOR / DECODER / TIMER
SIZE B
CODE
NUMBER 1200101 D1
REV A
DATE 19.FEBRUAR 1987
MK2\MK21PROC


LCDAS
HC573
U18
U19
U20
U21
6264
MSM5240GS
U17
CLK2
LCDW
-12V
R20
470E
P1
5k
R19
4x7
HC04
U15E
R4
3.3 M
Q3
24.000 MHz
C7
10 pF
C8
33 pF
CBUS
ICBUS
MB473201
U16
ST5BUS
HC390
U24
HC259
U22
5930S
U23
U55
HC257
U25
U26
U27
R5 10k
R6 10k
R31 100k
R32 100k
R33 100k
R34 100k
KBIN0
KBIN1
KBIN2
KBIN3
KBIN4
KBIN5
KBIN6
KBIN7
KBIN8
KBIN9
KBIN10
KBIN11
Connect to pull-up arrays R21,R28,R30 (7*10k):
- U25: 2,5,6,10,11,13,14
- U26: 2,3,5,11,14
- U27: 2,5,6,10,11,13,14
SCHILLER AG, CH-6340 BAAR
ALTGASSE 68
TITLE
MICROCOMPUTER MK2-1
LCD CONTROLLER
SIZE B
CODE
NUMBER 1100101 D2
REV A
DATE 18 JUNE 1986
SHEET


LCDAS
HC573
U18
HC573
U19
MSM6240GS
U17
6264
U20
HC573
U21
LCDW
CBUS
IOBUS
M8673201
U16
HC390
U24
HC259
U22
HC04
U15E
-12V
R20
470E
P1
5k
R19
4k7
R4
3.8 M
C7
10 pF
C8
33 pF
Q3
24.000 MHz
CLK2
VO
SID
SIF
BLOW
PMARK
MCLK
SOD
STSBUS
FW
KONV
SIF
FF
SOF
BAT
IN1
SOS
TPS
MON
SOD
59308
U23
59308
U55
HC257
U25
HC257
U26
HC257
U27
R6 10k
R31 100k
R32 100k
R34 100k
R33 100k
KBIN0
KBIN1
KBIN2
KBIN3
KBIN4
KBIN5
KBIN6
KBIN7
KBIN8
KBIN9
KBIN10
KBIN11
Connect to pull-up arrays
R21,R28,R30 (7*10k):
- U25: 2,5,6,10,11,13,14
- U26: 2,3,5,11,14
- U27: 2,5,6,10,11,13,14
SCHILLER AG, CH-6340 BAAR
ALTGASSE 68
TITLE
MICROCOMPUTER MK2-1
LCD CONTROLLER
SIZE
B
CODE
NUMBER
1200101 D2
REV
A
DATE 18 JUNE 1986
SHEET

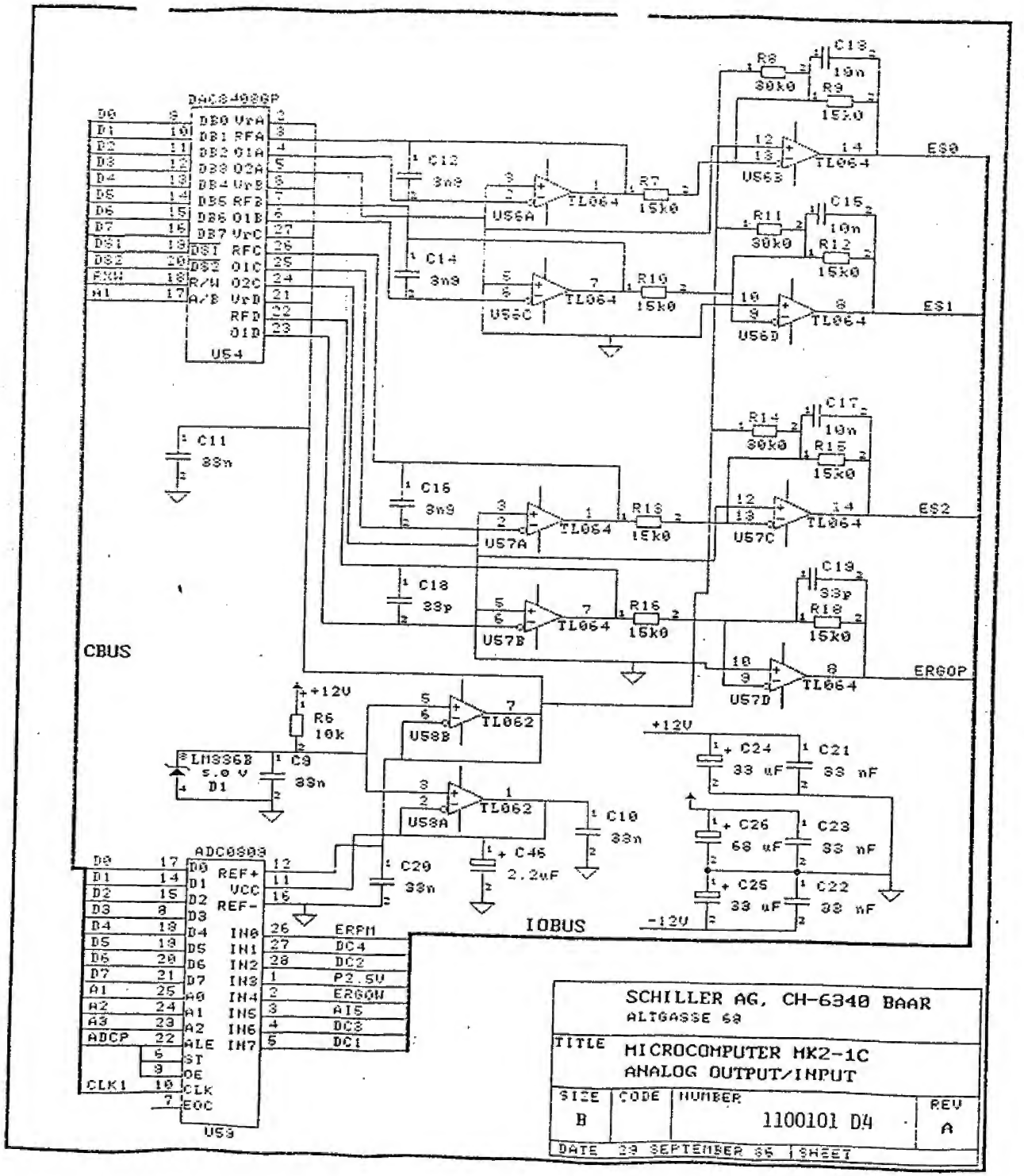

CBUS
27C256
U47
U49
U51
U48
U50
U52
HC257
U33
U34
U35
U36
U37
U38
U39
U40
TM4256
U41
U42
U43
U44
6264
U45
U46
HC32
U32A
U32B
U32C
U32D
R23
470E
C6
33pF
J1
J2
J3
PAE
A16
A14
SAE
LWE
LSX
A15
USX
UWE
A16
PAX
UDS
ASRAM
REFR
LDS
DRAM1
AS
DRAM2
UCAS
LCAS
RAS1
RAS2
SCHILLER AG, CH-6340 BAAR
ALTGASSE 68
TITLE
PROCESSOR CARD MK2-1/C
MEMORY
SIZE
B
CODE
NUMBER
1100101 D3
REV
A
DATE
29 SEPTEMBER 86
SHEET

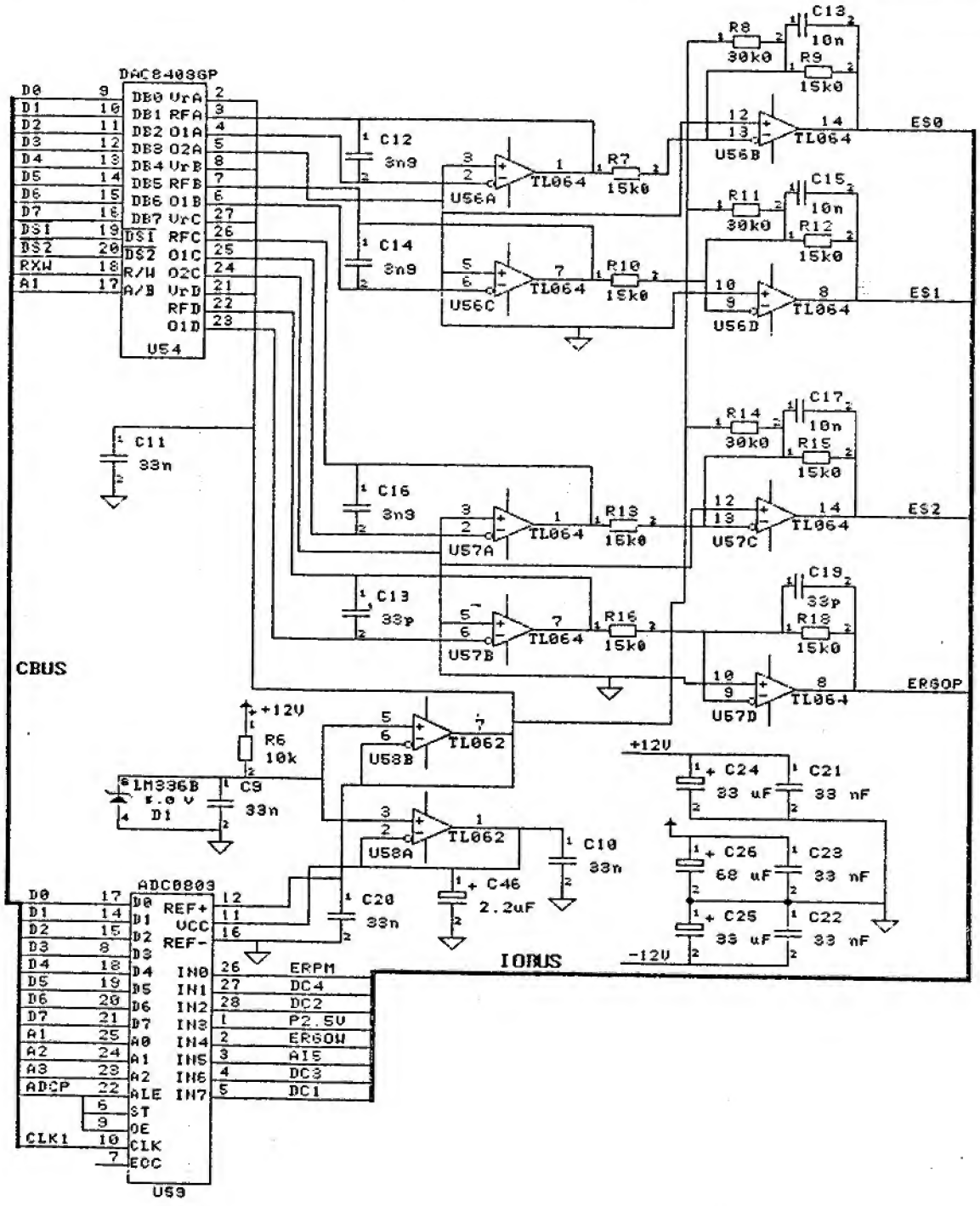

CBUS
27C256
U47
U49
U51
U48
U50
U52
HC257
U33
U34
U35
TM4256
U36
U37
U38
U39
U41
U42
U43
U44
6264
U45
U46
R29
470E
C6
33pF
HC32
U32A
U32B
U32C
U32D
U40
J1
J2
J3
PAE
A1E
A14
SAE
LWE
LSX
A15
USX
UWE
A16
PAX
UDS
ASRAM
REFR
LDS
DRAM1
AS
DRAM2
UCAS
LCAS
RAS1
RAS2
SCHILLER AG, CH-6340 BAAR
ALTGASSE 68
TITLE
PROCESSOR CARD MK2-1/C
MEMORY
SIZE
B
CODE
NUMBER
1200101 D3
REV
A
DATE 29 SEPTEMBER 35
FILE:MK2\MK21MEM



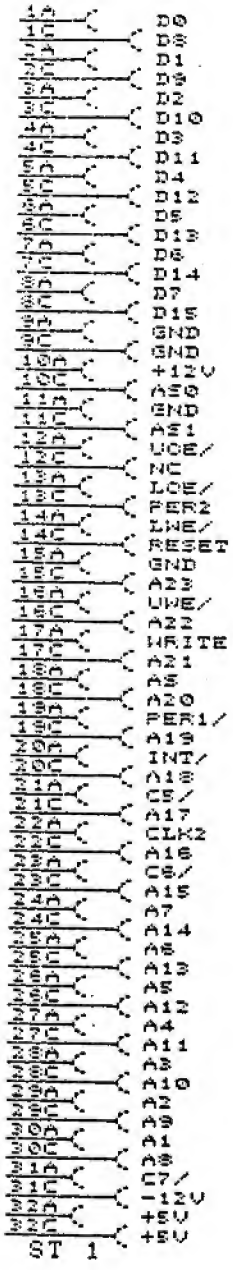
VCC Pin 16
GND Pin 20
NC PIN 5 at GND

SCHILLER AG, CH-6340 BAAR ALTGASSE 68			
TITLE: PROCESSOR CARD MK2-1/D MEMORY 2			
SIZE	CODE	NUMBER 1200101	REV B
DATE: 19. June 1989	File: MK2/MEMORY2		

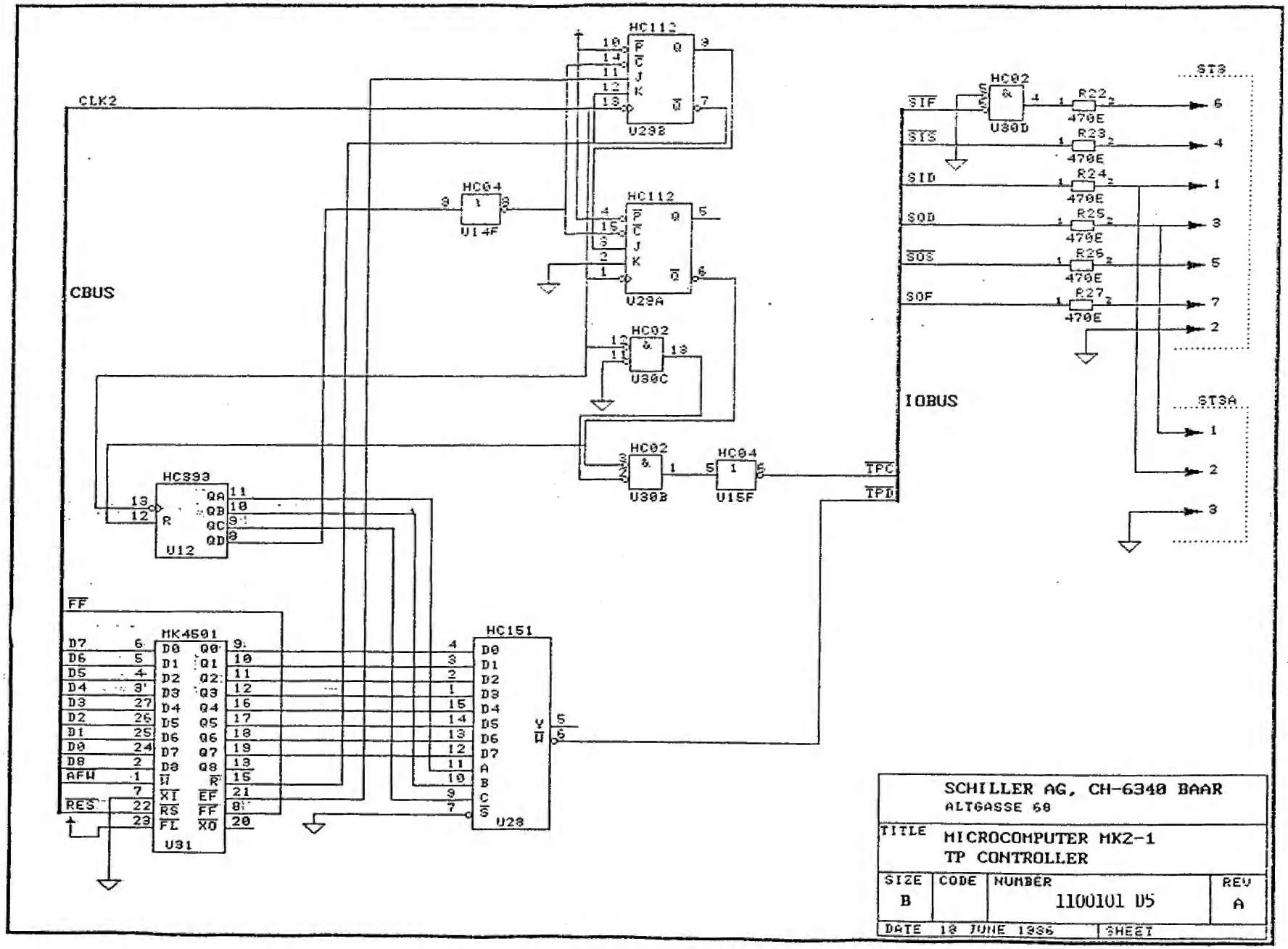

DAC8408BP
U54
TL064
U56A
U56C
U56B
U56D
U57A
U57C
U57B
U57D
TL062
U58B
U58A
ADC0803
U59
LM336B
5.0 V
D1
CBUS
IOBUS
+12V
-12V
ES0
ES1
ES2
ERGOP
ERPM
DC4
DC2
P2.5V
ERGON
AI5
DC3
DC1
SCHILLER AG, CH-6340 BAAR
ALTGASSE 68
TITLE
MICROCOMPUTER MK2-1C
ANALOG OUTPUT/INPUT
SIZE
B
CODE
NUMBER
1100101 D4
REV
A
DATE 29 SEPTEMBER 86
SHEET

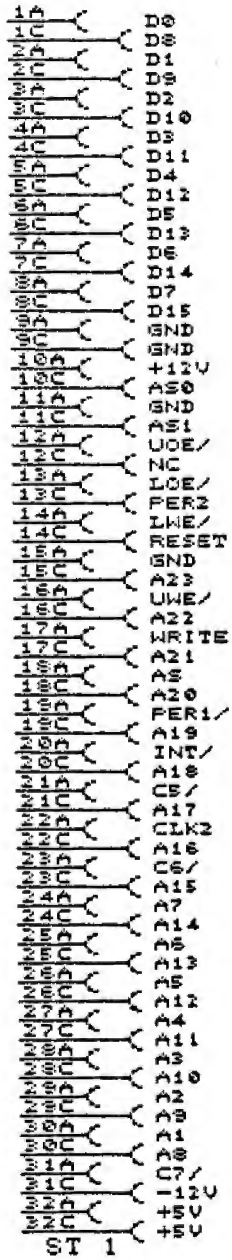


SCHILLER AG, CH-6340 BAAR ALTGASSE 69			
TITLE: MICROCOMPUTER MK2-1C ANALOG OUTPUT/INPUT			
SIZE: B	CODE:	NUMBER: 1200101 D4	REV: A

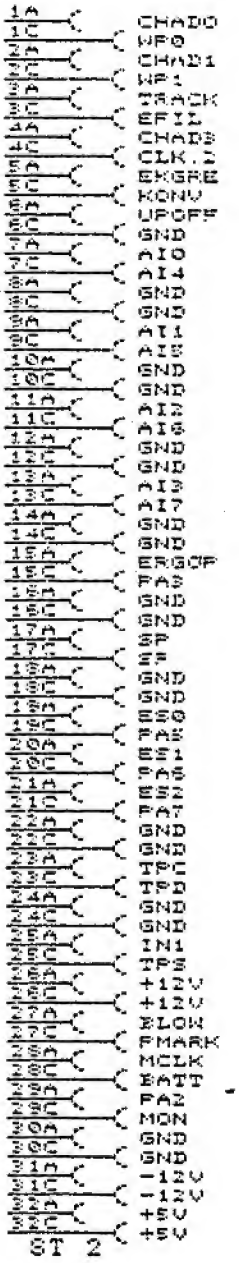


SCHILLER AG, CH-6340 BAAR ALTGASSE 68		
TITLE	PINBELEGUNG PINOUT	ST 1 MK2-1C
SIZE B	CODE	NUMBER 1100101 D6
REV A		
DATE 3. OKT. 1986	SHEET	

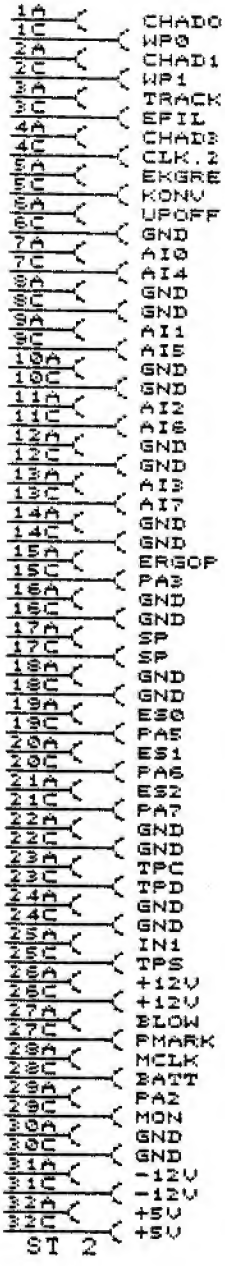

HC112
U29B
CLK2
HC04
U14F
HC112
U29A
CBUS
HC02
U30C
HC02
U30B
HC04
U15F
HC393
U12
FF
MK4501
U31
HC151
U28
TPC
TPD
IOBUS
HC02
U30D
SIF
SIS
SID
SOD
SOS
SOF
R22 470E
R23 470E
R24 470E
R25 470E
R26 470E
R27 470E
ST3
ST3A
SCHILLER AG, CH-6340 BAAR
ALTGASSE 68
TITLE
MICROCOMPUTER MK2-1
TP CONTROLLER
SIZE
B
CODE
NUMBER
1100101 D5
REV
A
DATE 10 JUNE 1986
SHEET



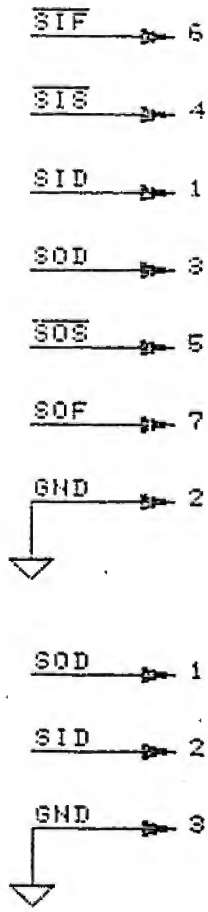
SCHILLER AG, CH-6340 BAAR ALTGASSE 68			
TITLE	PINBELEGUNG PINOUT	ST 1 MK2-1C	
SIZE B	CODE	NUMBER 1200101 D6	REV A
DATE 9. OKT. 1986		SHEET	



SCHILLER AG, CH-6340 BAAR ALTGASSE 68		
TITLE	PINBELEGUNG PINOUT	ST 2 MK2-1C
SIZE: B	CODE:	NUMBER: 1100101 D7
REV: A		
DATE: 3. OKT. 1988	SHEET:	



SCHILLER AG, CH-6340 BAAR ALTGASSE 68			
TITLE	PINBELEGUNG PINOUT	ST 2 MK2-1C	
SIZE B	CODE	NUMBER 1200101 D7	REV A
DATE 9. OKT. 1986		SHEET	



ST 3

ST 3A
AT 6

ST 4

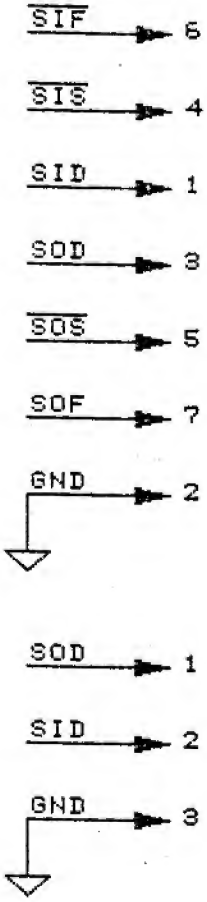
	a	b
1	DD1	DFLM
2	DM	DCL1
3	DCL2	DD2
4	+5V	GND
5	-12V	VO

SCHILLER AG, CH-6340 BAAR
ALTGASSE 68

TITLE PINBELEGUNG ST 3(A)/ST 4
PINOUT HK2-1C

SIZE	CODE	NUMBER	REV
B		1108101 D8	A

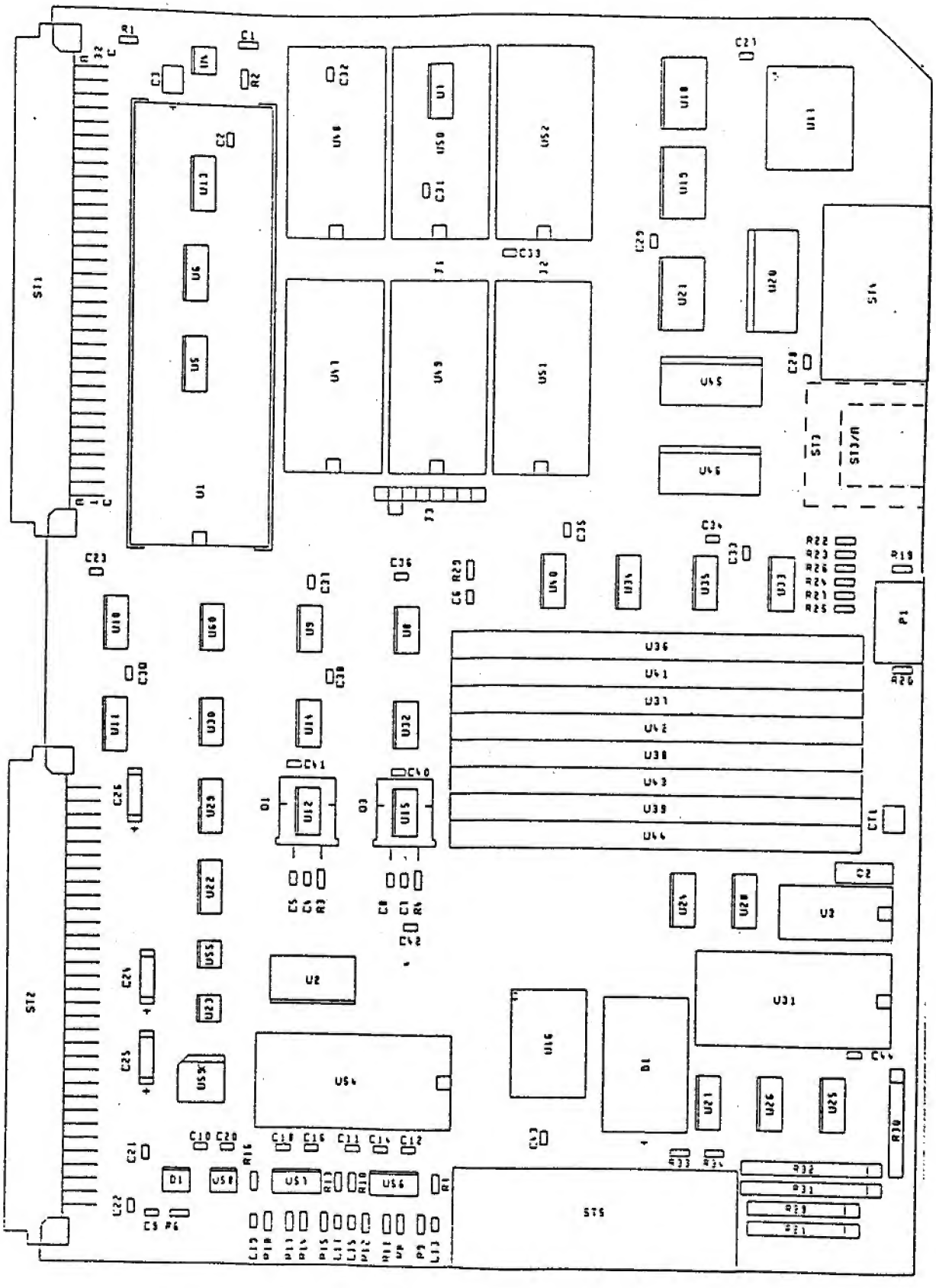
DATE 8. OKT. 1986 SHEET



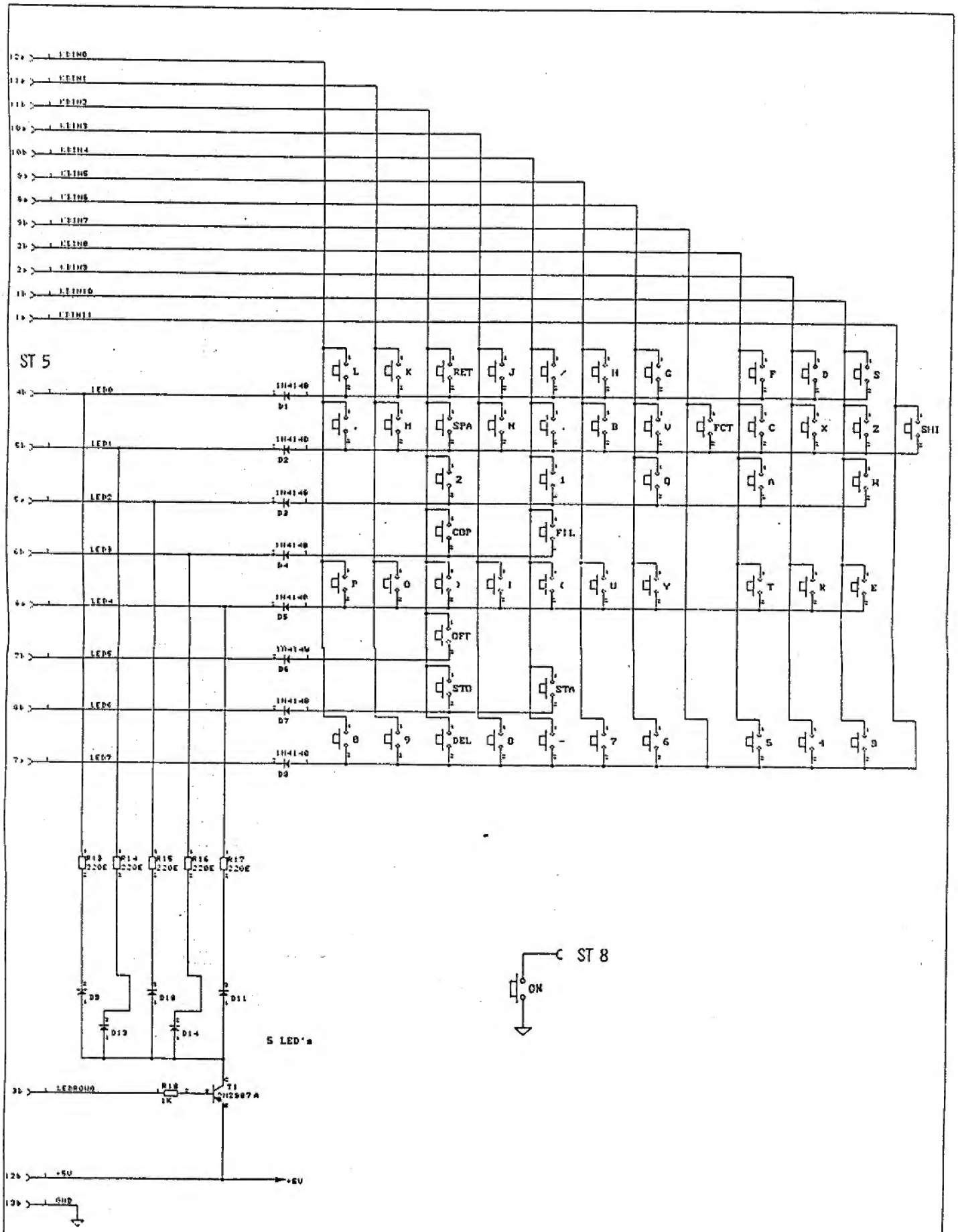
ST 4

	a	b
1	DD1	DFLM
2	DM	DCL1
3	DCL2	DD2
4	+5V	GND
5	-12V	VO

SCHILLER AG, CH-6340 BAAR ALTGASSE 68			
TITLE: PINBELEGUNG ST 3(A)/ST 4 PINOUT MK2-1C			
SIZE: B	CODE:	NUMBER: 1200101 DS	REV: A
DATE: 9. OKT. 1986		SHEET:	



SCHILLER AG, CH-6340 BAAR ALTGASSE 68			
TITLE DISPOSITION MK2-1C			
SIZE B	CODE	NUMBER 1100103	REV A
DATE 30 APRIL 1986		SHEET	


ST 5
ST 8
ON
5 LED's
SCHILLER AG. CH-6340 BAAR
KEYBOARD / TASTATUR AT-6
MX2-3
1100301 B1
30 SEPT 1986

ST 5

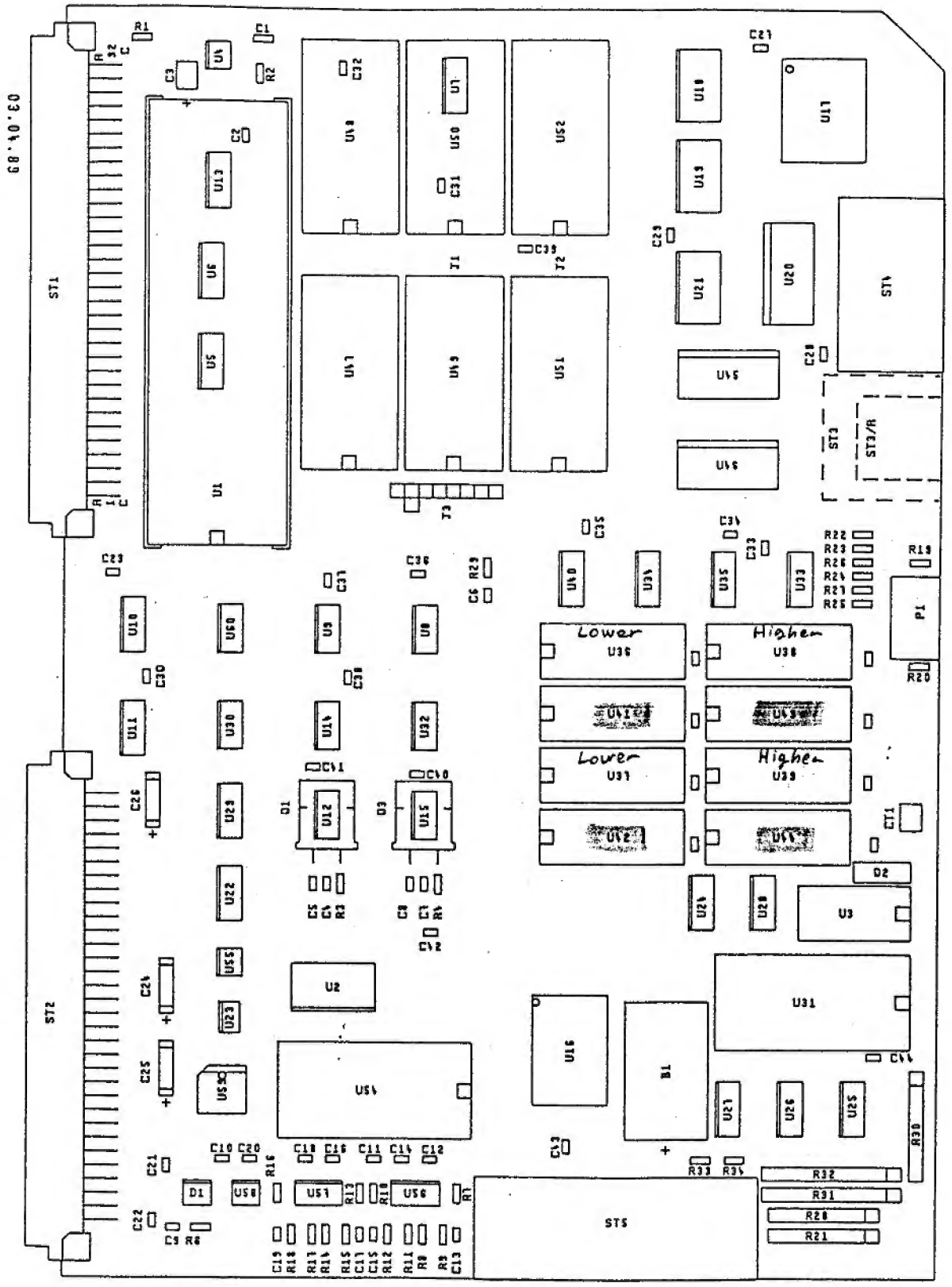
	a	b
1	KBIN11	KBIN10
2	KBIN9	KBIN8
3	LEDROW1	LEDROW0
4	LEDROW2	LED0
5	LED2	LED1
6	LED4	LED3
7	LED7	LED5
8	KBIN6	LED6
9	KBIN5	KBIN7
10	KBIN3	KBIN4
11	KBIN1	KBIN2
12	KBIN0	+5V
13	LEDROW3	GND

SCHILLER AG, CH-6340 BAAR ALTGASSE 68			
TITLE: PINBELEGUNG ST 5 PINOUT MK2-1C			
SIZE: B	CODE:	NUMBER: 1100101 D9	REV: A
DATE: 9. OKT. 1986	SHEET		

ST 5

	a	b
1	KBIN11	KBIN10
2	KBIN9	KBIN8
3	LEDROW1	LEDROW0
4	LEDROW2	LED0
5	LED2	LED1
6	LED4	LED3
7	LED7	LED5
8	KBIN6	LED6
9	KBIN5	KBIN7
10	KBIN3	KBIN4
11	KBIN1	KBIN2
12	KBIN0	+5V
13	LEDROW3	GND

SCHILLER AG, CH-6340 BAAR ALTGASSE 68			
TITLE: PINBELEGUNG ST 5 PINOUT MK2-1C			
SIZE: B	CODE:	NUMBER: 1200101 D9	REV: A
DATE: 9. OKT. 1986		SHEET:	



Bank 1

Bank 2

SCHILLER AG, CH-6340 BAAR ALTGASSE 68			
TITLE	MICROCOMPUTER MK2-1E DISPOSITION		
SIZE B	CODE	NUMBER	REV A
DATE 16.JUNE 1989		FILE:	

262144-word x 4-bit CMOS Dynamic Random Access Memory

128 kbit / chip.

The Hitachi HM514256 Series is a CMOS dynamic RAM organized 262144-word x 4-bit. HM514256 has realized higher density, higher performance and various functions by employing 1.3 μm CMOS process technology and some new CMOS circuit design technologies. The HM514256 offers Page Mode as a high speed access mode.

Multiplexed address input permits the HM514256 to be packaged in standard 20-pin plastic DIP, 20-pin plastic SOJ and 20-pin plastic ZIP.

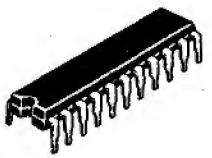
Features

- High Speed . . . . . Access Time 100/120/150 ns (max)
- Lower Power . . . . Active 300 mW, Standby 11mW
- Single 5V (±10%)
- Page Mode
- 512 refresh cycle . . . . . 8 ms
- 2 variations of refresh . . . . . $\overline{RAS}$ only refresh
  $\overline{CAS}$ before $\overline{RAS}$ refresh

Ordering Information

Type No.	Access Time	Package
HM514256P-10	100 ns	300 mil 20 pin Plastic DIP
HM514256P-12	120ns	
HM514256P-15	150ns	
HM514256ZP-10	100ns	20 pin Plastic ZIP
HM514256ZP-12	120ns	
HM514256ZP-15	150ns	
HM514256JP-10	100ns	20 pin Plastic SOJ
HM514256JP-12	120ns	
HM514256JP-15	150ns	

HM514256P Series



(DP-20NA)

HM514256ZP Series

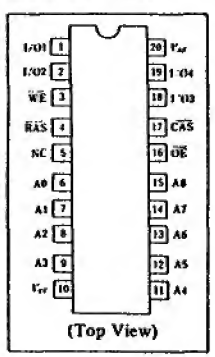
(ZP-20)

HM514256JP Series

(CP-20D)

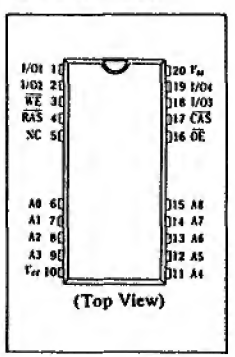
Pin Arrangement

HM514256P Series



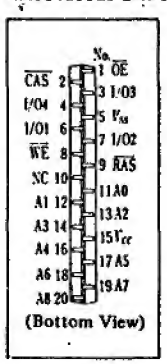
(Top View)

HM514256JP Series



(Top View)

HM514256ZP Series



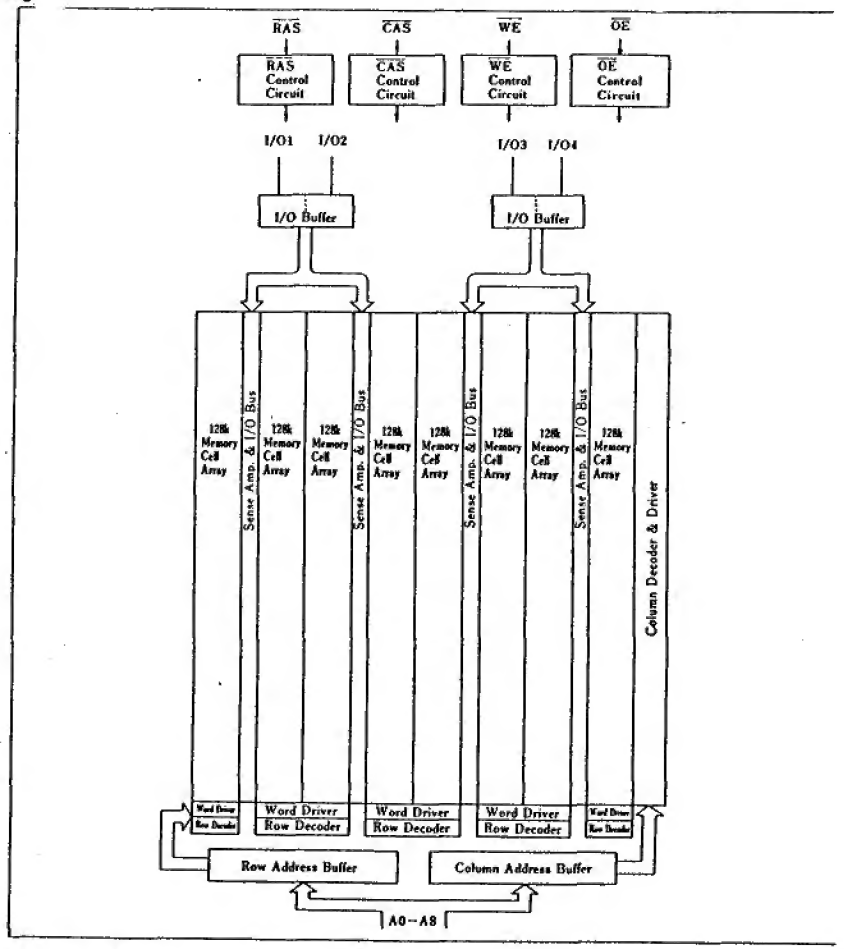
(Bottom View)

Pin Description

A0 - A8	Address Inputs
$\overline{CAS}$	Column Address Strobe
I/O - I/O4	Data In/Data Out
$\overline{OE}$	Output Enable
$\overline{RAS}$	Row Address Strobe
$\overline{WE}$	Read/Write Input
V_{CC}	Power (+5V)
V_{SS}	Ground
A0 - A8	Refresh Address Input

Note) The specifications of this device are subject to change without notice. Please contact your nearest Hitachi's Sales Dept. regarding specifications.

Block Diag



Absolute Maximum Ratings

Voltage on any pin relative to V_{SS} . . . . . -1V to +7V
Operating temperature, Ta (Ambient) . . . . . 0°C to +70°C
Storage temperature (Ambient) . . . . . -55°C to +125°C
Power dissipation . . . . . 1 W
Short circuit output current . . . . . 50 mA

Recommended DC Operating Conditions (Ta = 0 to +70°C)

Parameter	Symbol	Min	Typ	Max	Unit
Supply voltage	V_{CC}	4.5	5.0	5.5	V
Input High voltage	V_{IH}	2.4	–	6.5	V
Input Low voltage	V_{IL}	−2.0	–	0.8	V

Note) All voltages referenced to V_{SS}.

DC Electrical Characteristics ($Ta = 0$ to $+70°C$, $V_{CC} = 5V \pm 10\%$, $V_{SS} = 0V$)

Parameter	Symbol	Min	Max	Unit	Notes
Operating current t_{RC} = 260 ns t_{RC} = 220 ns t_{RC} = 190 ns	I_{CC1}	–	40 47 55	mA	*1, *4
Standby current	I_{CC2}	– –	2 1	mA mA	TTL Interface CMOS Interface
Refresh current t_{RC} = 260 ns t_{RC} = 220 ns t_{RC} = 190 ns	I_{CC3}	–	40 47 55	mA	$\overline{RAS}$ only Refresh *1
Standby current (Dout Enable) $\overline{RAS} = V_{IH}$, $\overline{CAS} = V_{IL}$	I_{CC5}	–	5	mA	*1
Refresh current t_{RC} = 260 ns t_{RC} = 220 ns t_{RC} = 190 ns	I_{CC6}	–	40 47 55	mA	$\overline{CAS}$ before $\overline{RAS}$ Refresh
Operating current t_{RC} = 105 ns t_{RC} = 85 ns t_{RC} = 70 ns	I_{CC7}	–	40 47 55	mA	*1, *5 Page mode
Input leakage $0 < Vin < 7V$	I_{LI}	–10	10	µA	
Output leakage $0 < Vout < 7V$	I_{LO}	–10	10	µA	Dout is disabled
Output levels High Iout = –5 mA	V_{OH}	2.4	V_{CC}	V	
Low Iout = 4.2 mA	V_{OL}	0	0.4	V	

Capacitance

Parameter	Symbol	Typ	Max	Unit	Notes
Address	C_{I1}	–	5	pF	*2
$\overline{RAS}$, $\overline{CAS}$, $\overline{WE}$, $\overline{OE}$	C_{I2}	–	7	pF	*2
Data-In/Data-Out	$C_{I/O}$	–	10	pF	*2, *3

Notes) *1. I_{CC} depends on output loading condition when the device is selected, I_{CC} max is specified at the output open condition.
*2. Capacitance measured with Boonton Meter or effective capacitance measuring method.
*3. $\overline{CAS} = V_{IH}$ to disable Dout.
*4. Address can be changed less than 3 times while $\overline{RAS}$ is V_{IL}.
*5. Address can be changed once or less while $\overline{CAS} = V_{IH}$.

Electrical Characteristics and Recommended AC Operating Conditions

($Ta = 0$ to $+70°C$, $V_{CC} = 5V \pm 10\%$)*1,*10,*11

Parameter	Symbol	HM514256-10 min	HM514256-10 max	HM514256-12 min	HM514256-12 max	HM514256-15 min	HM514256-15 max	Unit	Notes
Access Time from $\overline{RAS}$	t_{RAC}	–	100	–	120	–	150	ns	*2,*3
Access Time from $\overline{CAS}$	t_{CAC}	–	50	–	60	–	75	ns	*3,*4
Output Buffer Turn-off Delay	t_{OFF1}	–	25	–	30	–	40	ns	*5
Output Buffer Turn-off Delay referenced to $\overline{OE}$	t_{OFF2}	–	25	–	30	–	40	ns	*5
Transition Time (Rise and Fall)	t_T	3	50	3	50	3	50	ns	*6
Random Read or Write Cycle Time	t_{RC}	190	–	220	–	260	–	ns	
$\overline{RAS}$ Precharge Time	t_{RP}	80	–	90	–	100	–	ns	

(to be continued)

Parameter	Symbol	HM514256-10 min	HM514256-10 max	HM514256 min	HM514256 max	HM514256-15 min	HM514256-15 max	Un
$\overline{RAS}$ Pulse Width	t_{RAS}	100	10000	120	10000	150	10000	ns
$\overline{CAS}$ Pulse Width	t_{CAS}	50	10000	60	10000	75	10000	ns
$\overline{RAS}$ to $\overline{CAS}$ Delay Time	t_{RCD}	25	50	25	60	30	75	ns
$\overline{RAS}$ Hold Time	t_{RSH}	50	–	60	–	75	–	ns
$\overline{CAS}$ Hold Time	t_{CSH}	100	–	120	–	150	–	ns
$\overline{CAS}$ to $\overline{RAS}$ Precharge Time	t_{CRP}	10	–	10	–	10	–	ns
Row Address Setup Time	t_{ASR}	0	–	0	–	0	–	ns
Row Address Hold Time	t_{RAH}	15	–	15	–	20	–	ns
Column Address Setup Time	t_{ASC}	0	–	0	–	0	–	ns
Column Address Hold Time	t_{CAH}	20	–	20	–	25	–	ns
Write Command Setup Time	t_{WCS}	0	–	0	–	0	–	ns
Write Command Hold Time	t_{WCH}	20	–	25	–	30	–	ns
Write Command Pulse Width	t_{WP}	15	–	20	–	25	–	ns
Write Command to $\overline{RAS}$ Lead Time	t_{RWL}	35	–	40	–	45	–	ns
Write Command to $\overline{CAS}$ Lead Time	t_{CWL}	35	–	40	–	45	–	ns
Data-in Setup Time	t_{DS}	0	–	0	–	0	–	ns
Data-in Hold Time	t_{DH}	20	–	25	–	30	–	ns
Read Command Setup Time	t_{RCS}	0	–	0	–	0	–	ns
Read Command Hold Time referenced to $\overline{CAS}$	t_{RCH}	0	–	0	–	0	–	ns
Read Command Hold Time referenced to $\overline{RAS}$	t_{RRH}	10	–	10	–	10	–	ns
Refresh Period	t_{REF}	–	8	–	8	–	8	ms
Read-Write Cycle Time	t_{RWC}	265	–	305	–	360	–	ns
Read Modify Write Cycle Time	t_{RWS}	175	–	205	–	250	–	ns
$\overline{RAS}$ to $\overline{WE}$ Delay	t_{RWD}	135	–	160	–	200	–	ns
$\overline{CAS}$ to $\overline{WE}$ Delay	t_{CWD}	85	–	100	–	125	–	ns
$\overline{CAS}$ Setup Time	t_{CSR}	10	–	10	–	10	–	ns
$\overline{CAS}$ Hold Time ($\overline{CAS}$ before $\overline{RAS}$ Refresh)	t_{CHR}	20	–	25	–	30	–	ns
$\overline{RAS}$ Precharge to $\overline{CAS}$ Hold Time	t_{RPC}	10	–	10	–	10	–	ns
Page Mode Read or Write Cycle	t_{PC}	70	–	85	–	105	–	ns
$\overline{CAS}$ Precharge Time, Page Cycle	t_{CP}	10	–	15	–	20	–	ns
Page Mode Read Modify Write Cycle	t_{PCM}	145	–	170	–	205	–	ns
Page Mode CAS Pulse Width (Read Modify Write Cycle)	t_{CRW}	125	–	145	–	175	–	ns
Access Time from $\overline{OE}$	t_{OAC}	–	25	–	30	–	40	ns
$\overline{OE}$ to Data-in Delay Time	t_{ODD}	25	–	30	–	40	–	ns
$\overline{CAS}$ to Data-in Delay Time	t_{CDD}	25	–	30	–	40	–	ns
$\overline{OE}$ Hold Time reference to Write	t_{OEH}	25	–	30	–	35	–	ns
$\overline{OE}$ Delay Time from Din	t_{DZO}	0	–	0	–	0	–	ns
$\overline{CAS}$ Delay Time from Din	t_{DZC}	0	–	0	–	0	–	ns

Notes) *1. AC measurements assume t_T = 5 ns.
*2. Assumes that $t_{RCD} \leq t_{RCD}$ (max). If t_{RCD} is greater than the maximum recommended value sho table, t_{RAC} exceeds the value shown.
*3. Measured with a load circuit equivalent to 2TTL loads and 100pF.
*4. Assumes that $t_{RCD} \geq t_{RCD}$ (max).
*5. t_{OFF} (max) defines the time at which the output achieves the open circuit condition and is not refe output voltage levels.
*6. V_{IH} (min) and V_{IL} (max) are reference levels for measuring timing of input signals. Also, transition measured between V_{IH} and V_{IL}.
*7. Operation with the t_{RCD} (max) limit insures that t_{RAC} (max) can be met, t_{RCD} (max) is specified ence point only, if t_{RCD} is greater than the specified t_{RCD} (max) limit, then access time is controll sively be t_{CAC}.
*8. t_{WCS} and t_{CWD} are not restrictive operating parameters. They are included in the data sheet as electric teristics only: if $t_{WCS} \geq t_{WCS}$ (min), the cycle is an early write cycle and the data out pin will rem circuit (high impedance) throughout the entire cycle; if $t_{CWD} \geq t_{CWD}$ (min), the cycle is a read/writ data output will contain data read from the selected cell; if neither of the above sets of conditions is the condition of the data out (at access time) is indeterminate.
*9. These parameters are referenced to $\overline{CAS}$ leading edge in early write cycles and to $\overline{WE}$ leading edge i write or read-modify-write cycles.
*10. An initial pause of 100µs is required after power-up. Then execute at least 8 initialization cycles.
*11. In delayed write or read-modify-write cycles, $\overline{OE}$ must disable output buffers prior to applying da device.

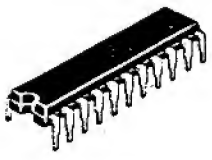
HM514256 Series — Preliminary

262144-word x 4-bit CMOS Dynamic Random Access Memory

The Hitachi HM514256 Series is a CMOS dynamic RAM organized 262144-word x 4-bit. HM514256 has realized higher density, higher performance and various functions by employing 1.3 μm CMOS process technology and some new CMOS circuit design technologies. The HM514256 offers Page Mode as a high speed access mode.

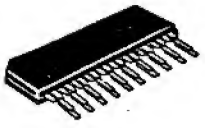
Multiplexed address input permits the HM514256 to be packaged in standard 20-pin plastic DIP, 20-pin plastic SOJ and 20-pin plastic ZIP.

HM514256P Series



(DP-20NA)

HM514256ZP Series



(ZP-20)

HM514256JP Series

(CP-20D)

Features

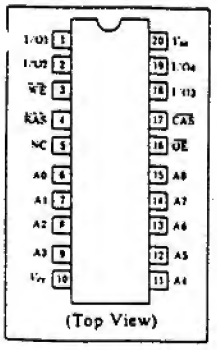
- High Speed ..... Access Time 100/120/150 ns (max)
- Lower Power .... Active 300 mW, Standby 11mW
- Single 5V (±10%)
- Page Mode
- 512 refresh cycle ..... 8 ms
- 2 variations of refresh ..... $\overline{RAS}$ only refresh
  $\overline{CAS}$ before $\overline{RAS}$ refresh

Ordering Information

Type No.	Access Time	Package
HM514256P-10	100 ns	300 mil 20 pin Plastic DIP
HM514256P-12	120ns	
HM514256P-15	150ns	
HM514256ZP-10	100ns	20 pin Plastic ZIP
HM514256ZP-12	120ns	
HM514256ZP-15	150ns	
HM514256JP-10	100ns	20 pin Plastic SOJ
HM514256JP-12	120ns	
HM514256JP-15	150ns	

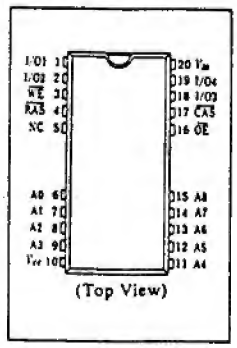
Pin Arrangement

HM514256P Series



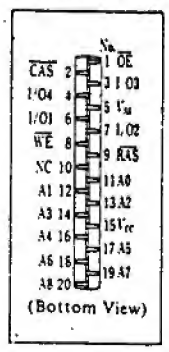
(Top View)

HM514256JP Series



(Top View)

HM514256ZP Series



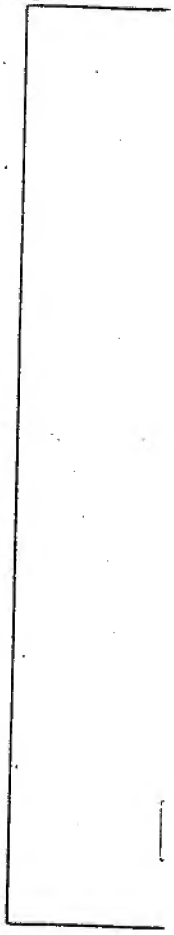
(Bottom View)

Pin Description

A0 - A8	Address Inputs
$\overline{CAS}$	Column Address Strobe
I/O - I/O4	Data In/Data Out
$\overline{OE}$	Output Enable
$\overline{RAS}$	Row Address Strobe
$\overline{WE}$	Read/Write Input
V_{CC}	Power (+5V)
V_{SS}	Ground
A0 - A8	Refresh Address Input

Note) The specifications of this device are subject to change without notice. Please contact your nearest Hitachi's Sales Dept. regarding specifications.

Block Diagram



Absolute Maximum Ratinç

Voltage on any pin relative
Operating temperature, Ta
Storage temperature (Amb
Power dissipation .....
Short circuit output curren

Recommended DC Operati

Parameter	Sy
Supply voltage	
Input High voltage	
Input Low voltage	

Note) All voltages referenced t

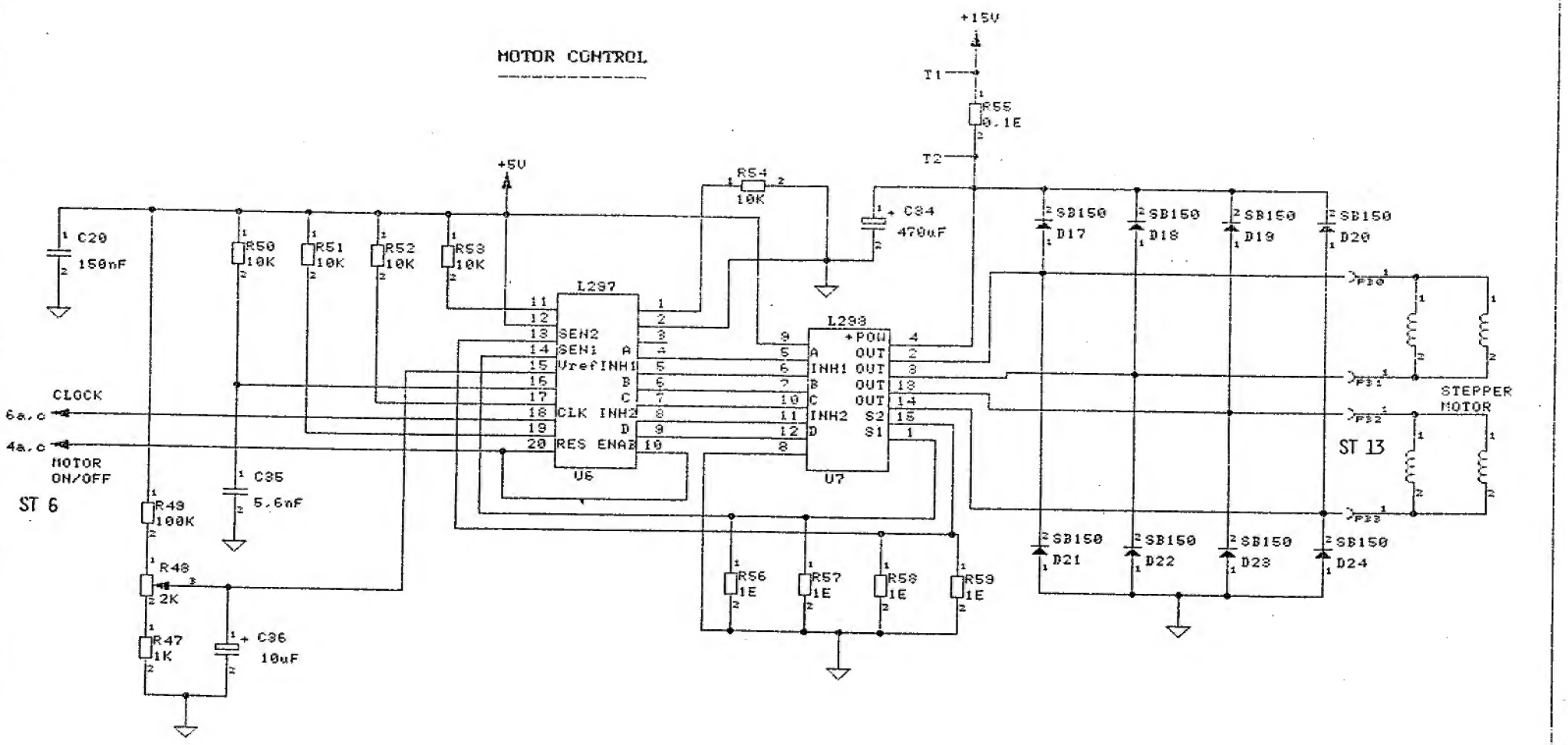
HITACHI

SECTION 3

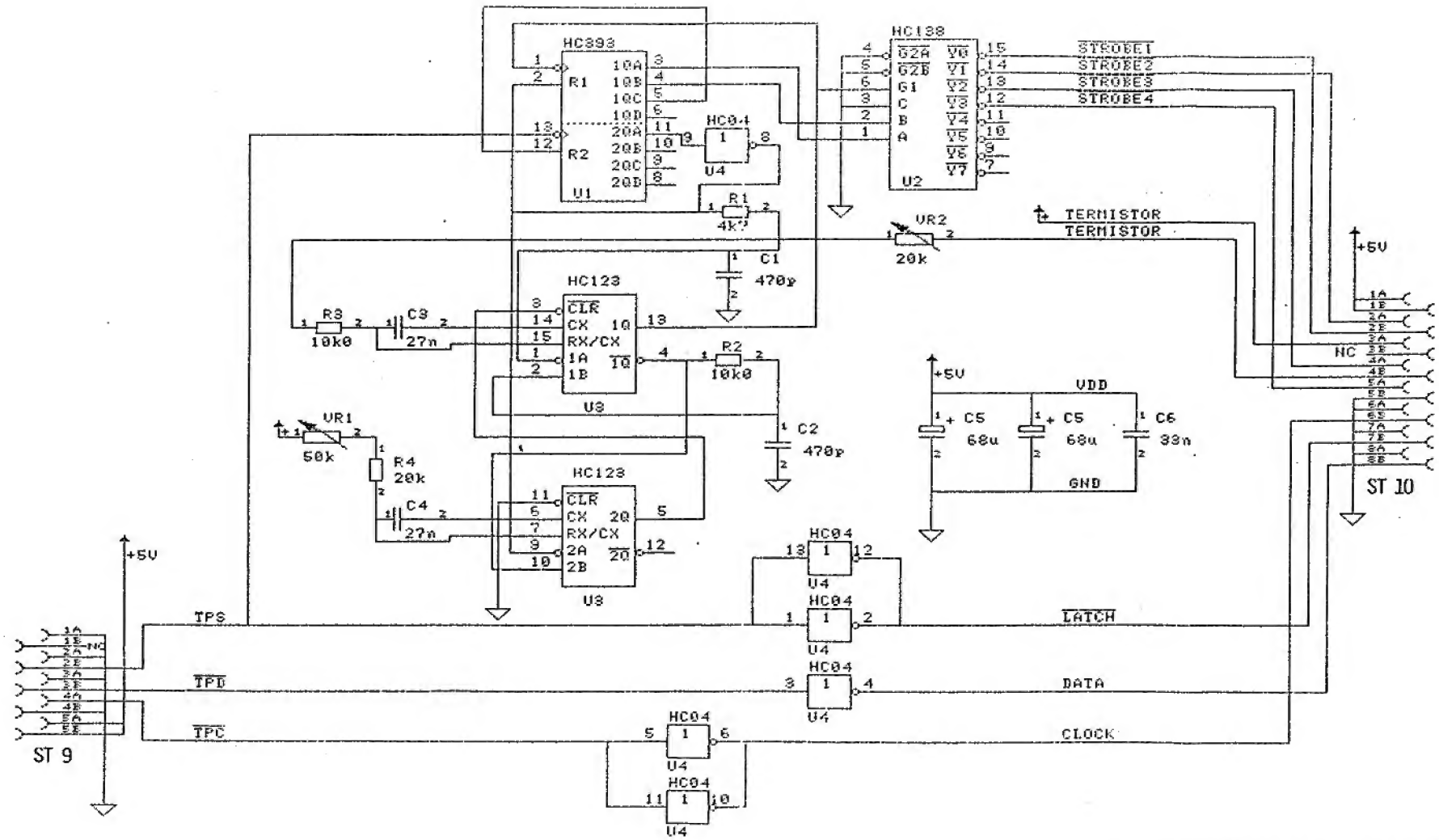
PRINTER TIMER / MOTOR CONTROL / PAPER MARK DETECTOR CIRCUITS

MK2-4 / MK2-5 / MK2-6

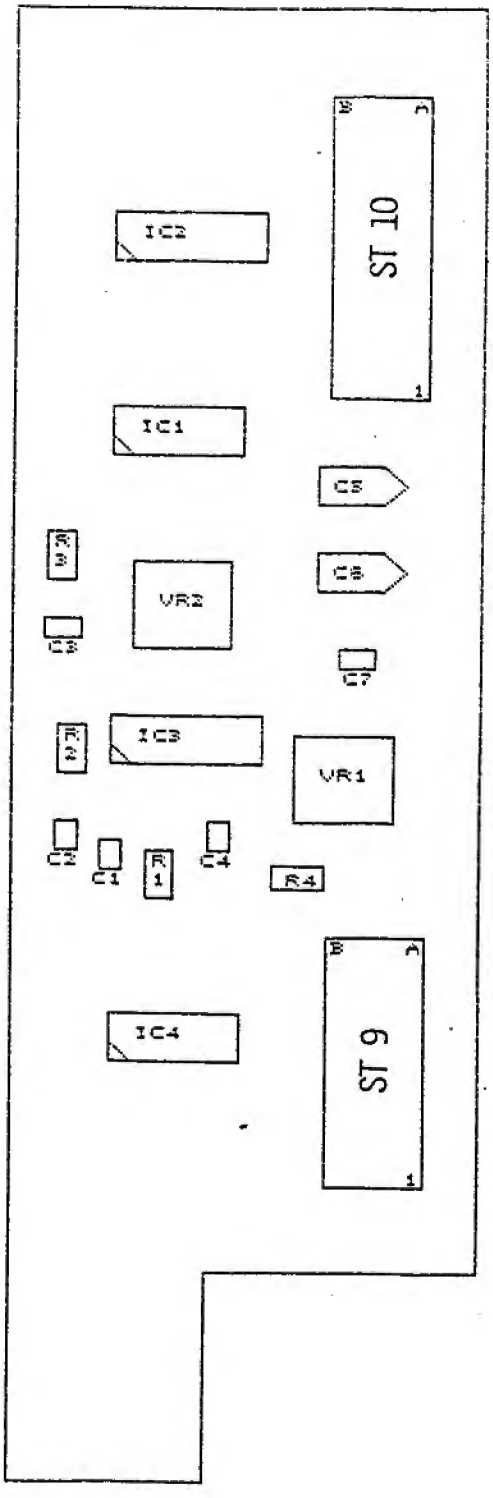
	Drawing No.
Motor Control MK2-6A	1100601 MC
Printer Timer Control MK2-5	1100501
PCB Layout - Timer MK2-5	1100503
Backplane MK2-4PD Paper Mark Detection Circuit	1100401 C3
PCB Layout MK2-4 - Backplane / Paper Mark	1100403
Power Supply MK2-6A - Layout	1100603



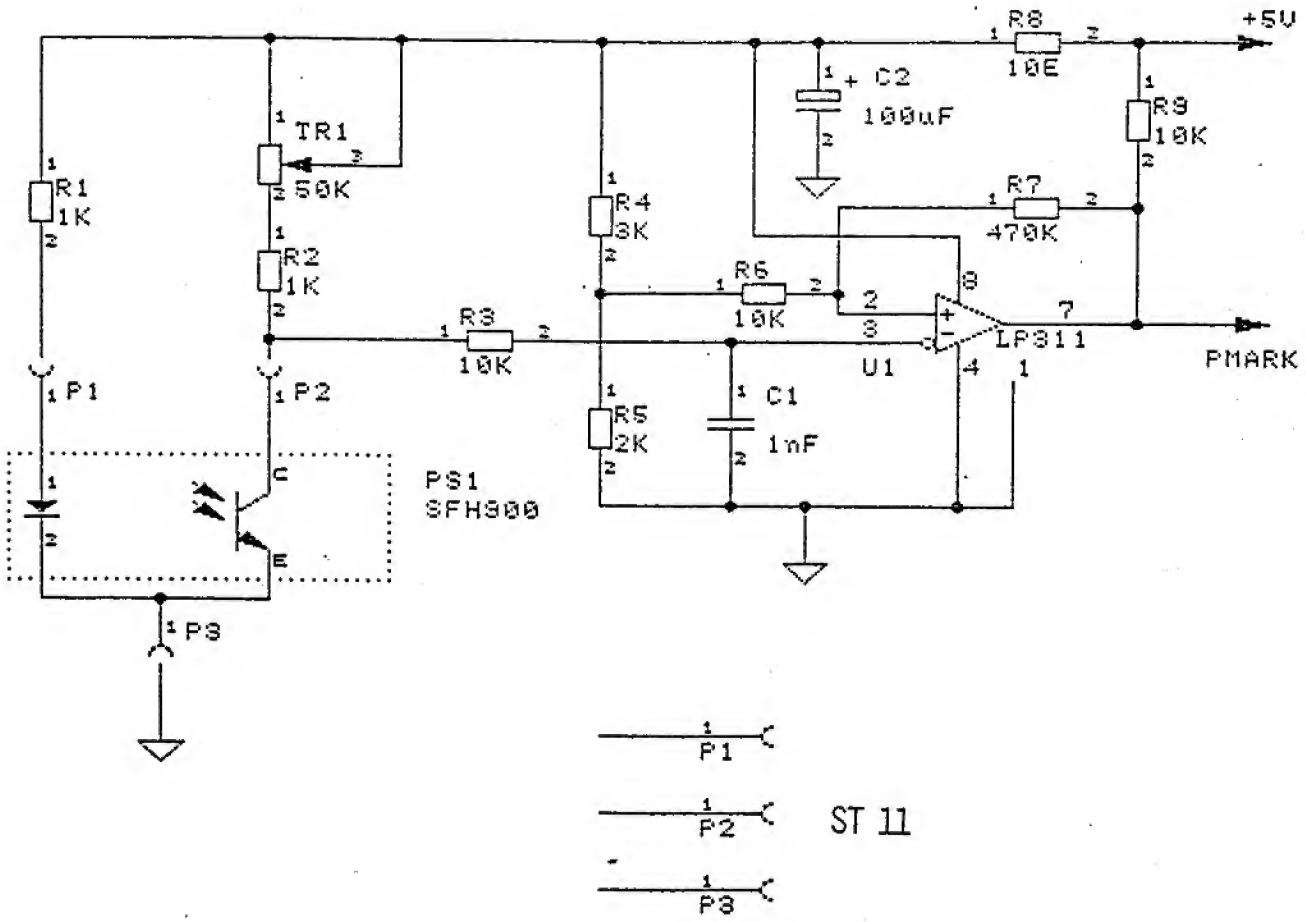
SCHILLER AG, CH-6348 BAAR ALTGASSE 68			
TITLE: MOTOR CONTROL MK2-6(A) MC			
SIZE: B	CODE:	NUMBER: 1100601 MC	REV: A
DATE: 20.MAI 1985		SHEET:	



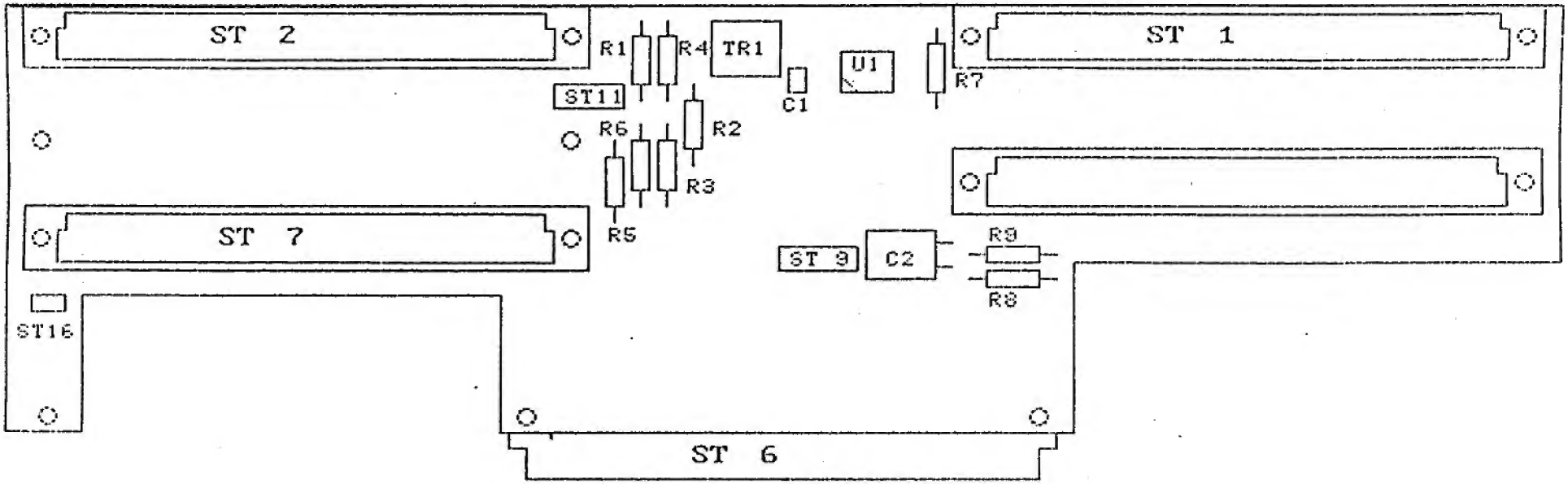
SCHILLER AG, CH-6340 BAAR ALTGASSE 68			
TITLE: PRINTER TIMER NKZ-5			
SIZE: B	CODE:	NUMBER: 1100501	REV: A
DATE: 30 SEPT. 1986	SHEET		



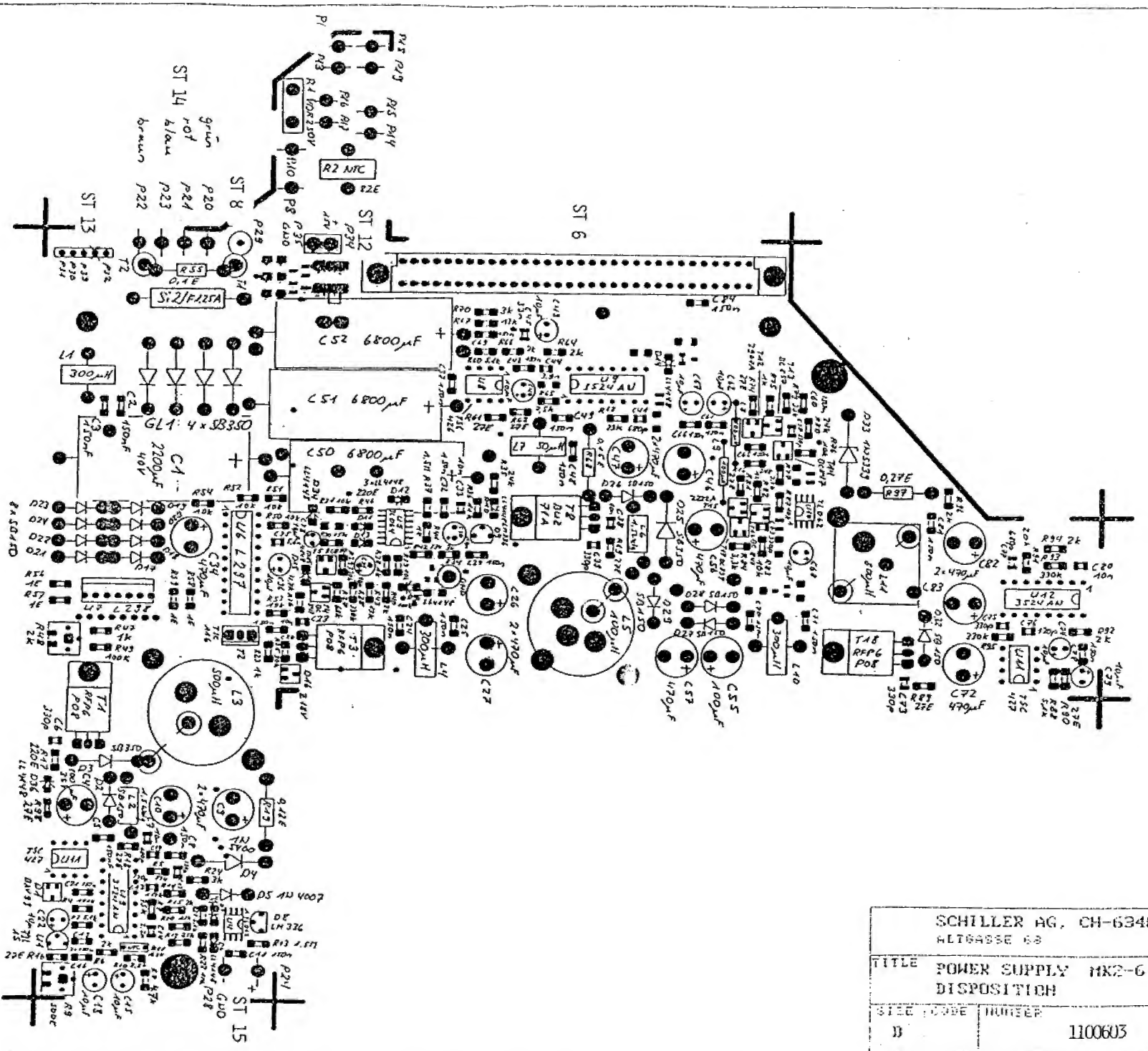
SCHILLER AG, CH-6348 BAAR ALTGASSE 68			
TITLE: PRINTER TIMER MK2-5 DISPOSITION			
SIZE: B	CODE:	NUMBER: 1100503	REV: A
DATE: 30.SEPT. 1986		SHEET:	



SCHILLER AG, CH-6340 BAAR ALTGASSE 68			
TITLE	BACKPLANE MK2-4 PD PAPERMARK DETECTOR		
SIZE B	CODE	NUMBER 1100401 C3	REV A
DATE 21.MAI 1986		SHEET	



SCHILLER AG, CH-6340 BAAR ALTGASSE 68			
TITLE DISPOSITION MK2-4			
SIZE B	CODE .	NUMBER 1100403	REV A
DATE 3. OKT. 1986		SHEET	

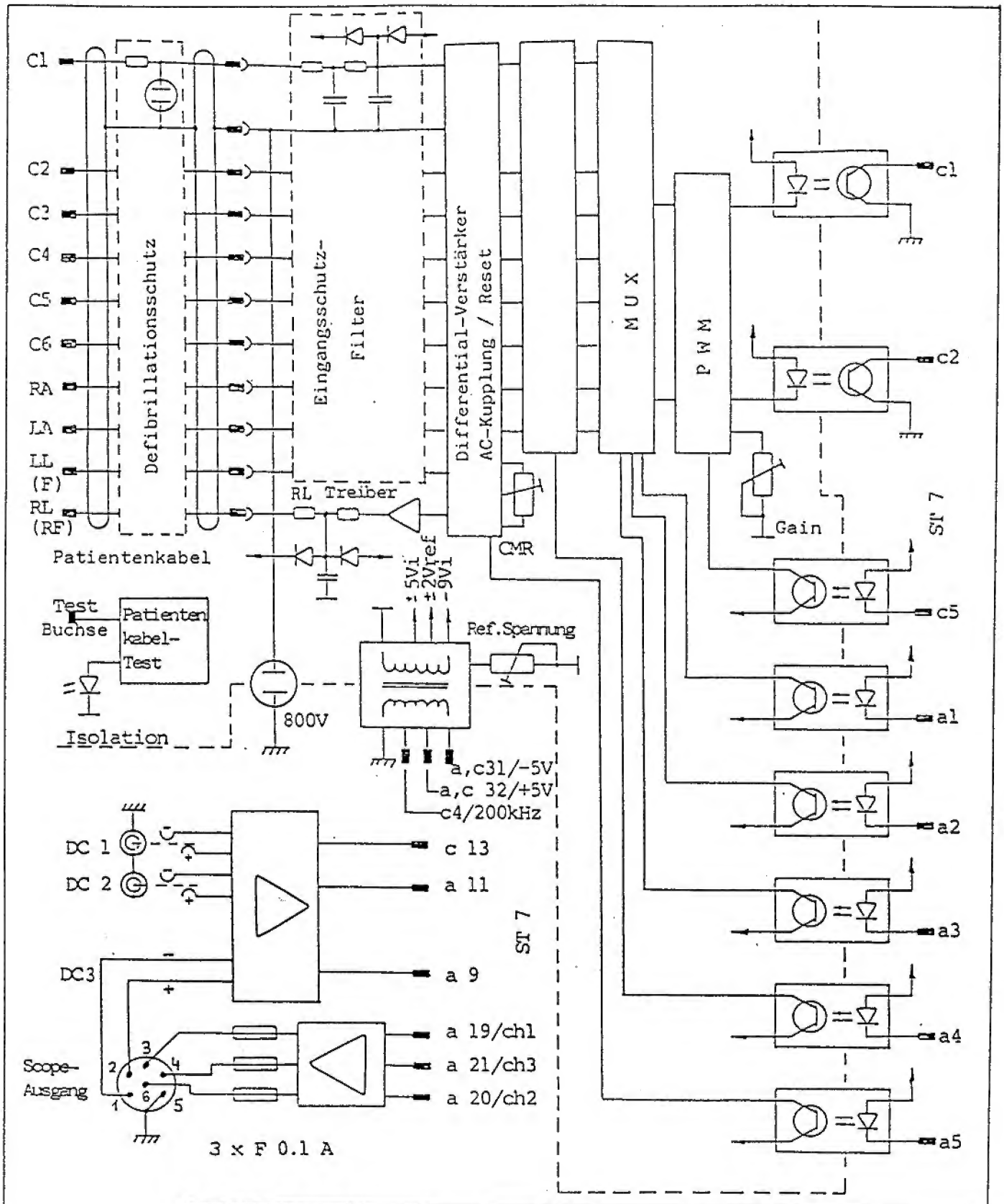


SCHILLER AG, CH-6340 BAAR ALTGASSE 68		
TITLE: POWER SUPPLY MK2-G(A) DISPOSITION		
SIZE / CODE: D	NUMBER: 1100603	REV: A
DATE: 25 SEPT 1985	SHEET	

SECTION 4

ECG AMPLIFIER CIRCUIT MK1-2

	Drawing No.
ECG Amplifier Block Diagram	1100200 a
ECG Amplifier MK1-2A Sub-blocks	1100201 A1
ECG Amplifier MK1-2D Sub-blocks	1200201 A1
Amplifier MK1-2 (A/C/D/F) Part A	1100201 A2
Amplifier MK1-2A Part B	1100201 A3
Amplifier MK4-2 Part B	1300201 A3
Amplifier MK1-2 (D/F) Part B	1300201 A3
Amplifier MK1-2 (A/D/F) Part C	1100201 A4
Amplifier Cable Tester	1100201 A5
Amplifier DC/DC Converter	1100201 A6
+ / - 2.5 Vdc References	1100201 A7
External DC Inputs	1200201 A8
Scope Output Drivers	1200201 A9
Amplifier MK1-2A PCB Layout	1100203
Amplifier MK1-2 PCB Layout	1200X03
Amplifier MK1-2D PCB Layout	1200203



Stück	Gegenstand Spécification	Pos. Rep.	Material Matière		Modell Modèle	Bemerkungen Observations
11 | 1	Änderungen: Modifications:				Ersetzt durch Remplacé par Ersatz für Remplace	

EKG - VERSTAEKER

MK1 - 2A

Maßstab Echelle

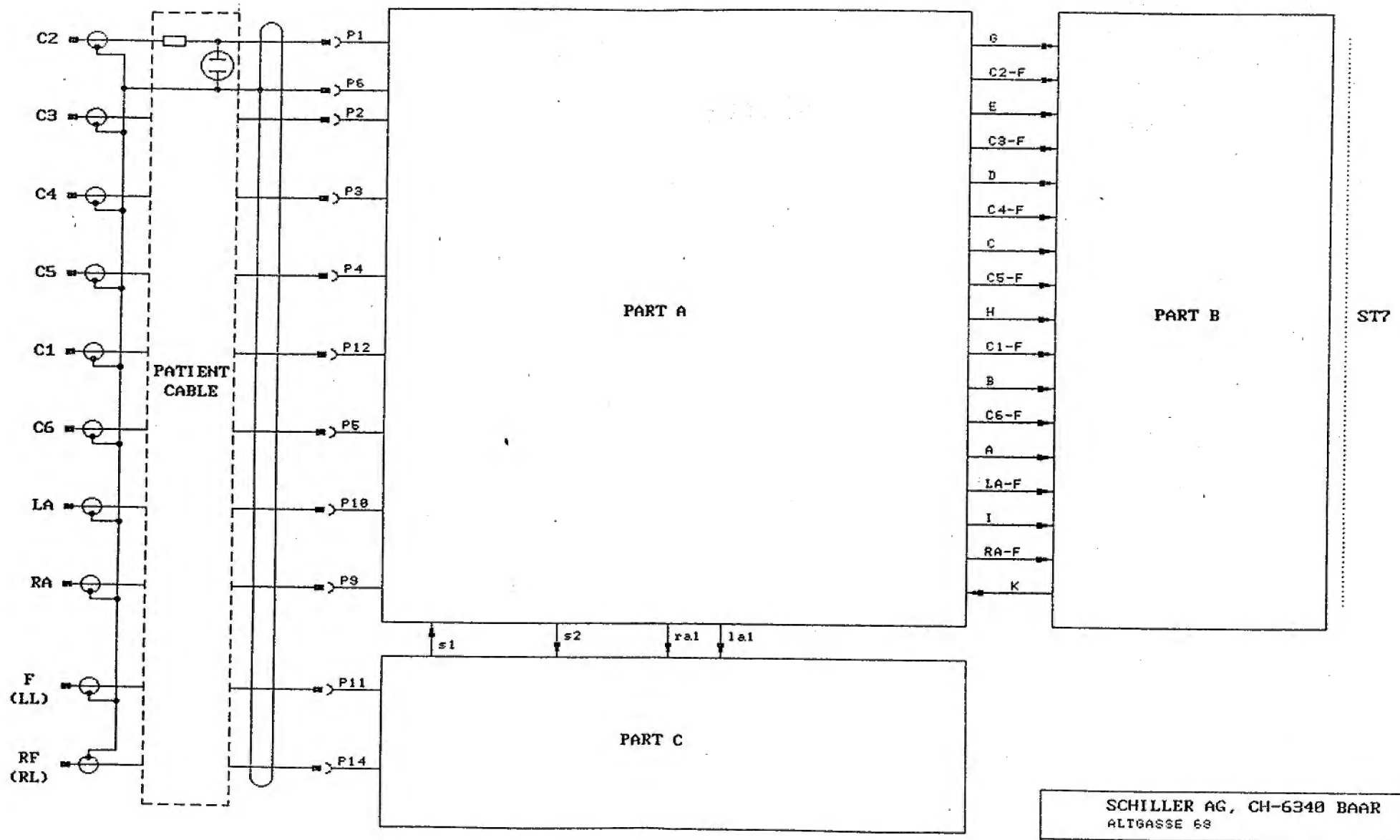
Gezeichnet Dessiné

Geprüft Contrôle

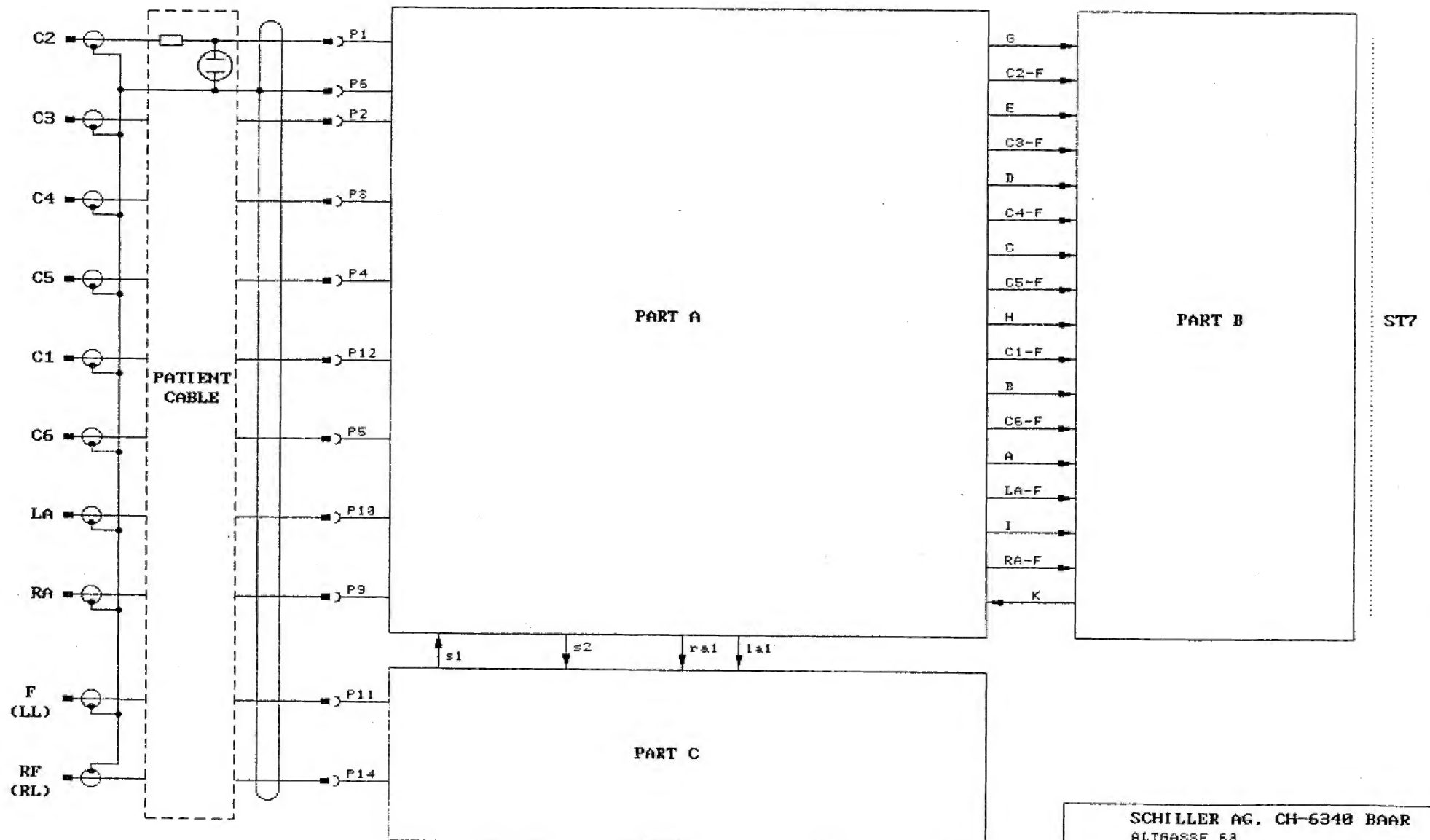
Gesehen Vu

SCHILLER Switzerland
Schiller AG
Altgasse 68
CH-6340 Baar
Telephone 042/31 53 31
Telex 865140 sbe ch
Telefax 042/31 08 80

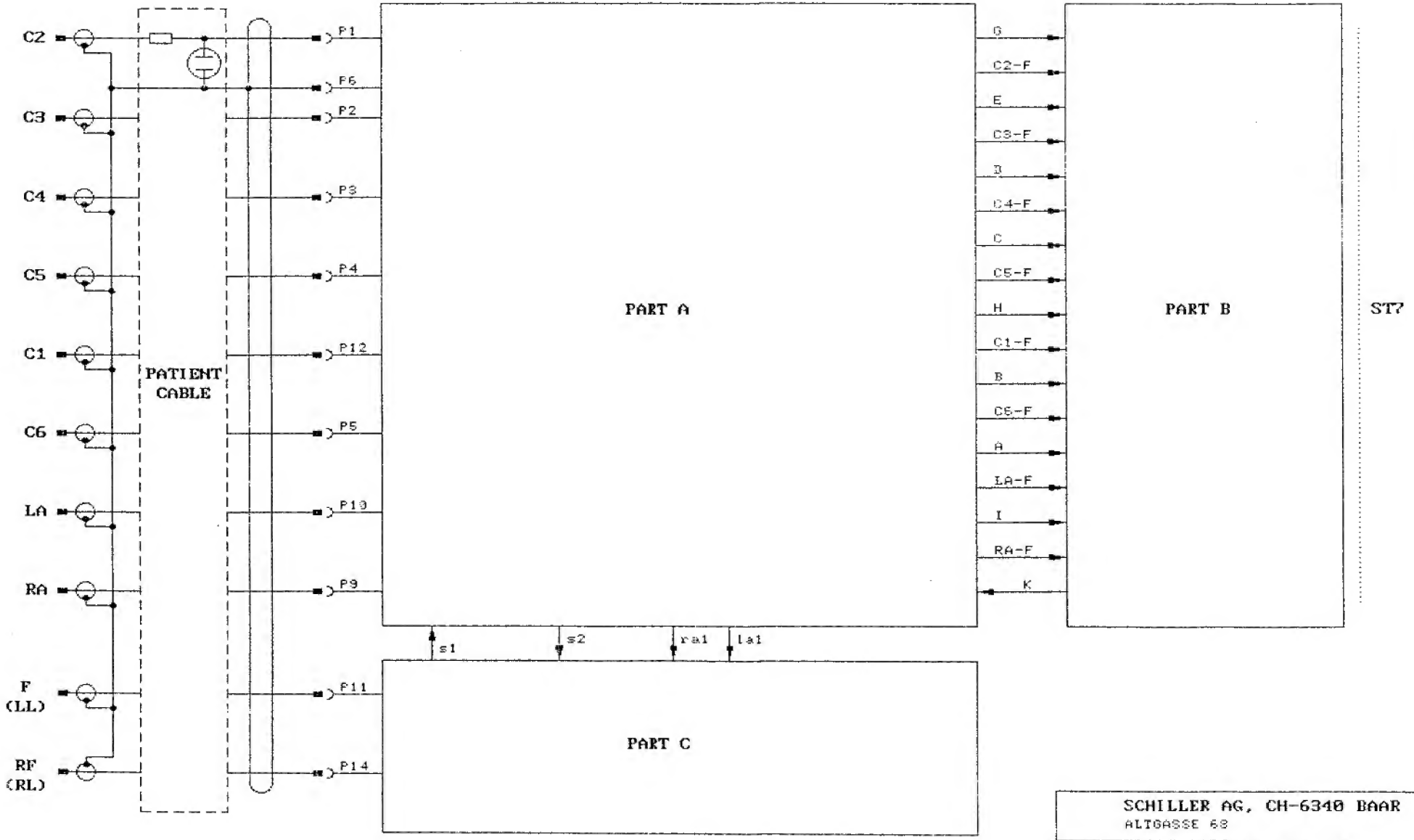
1100200 a



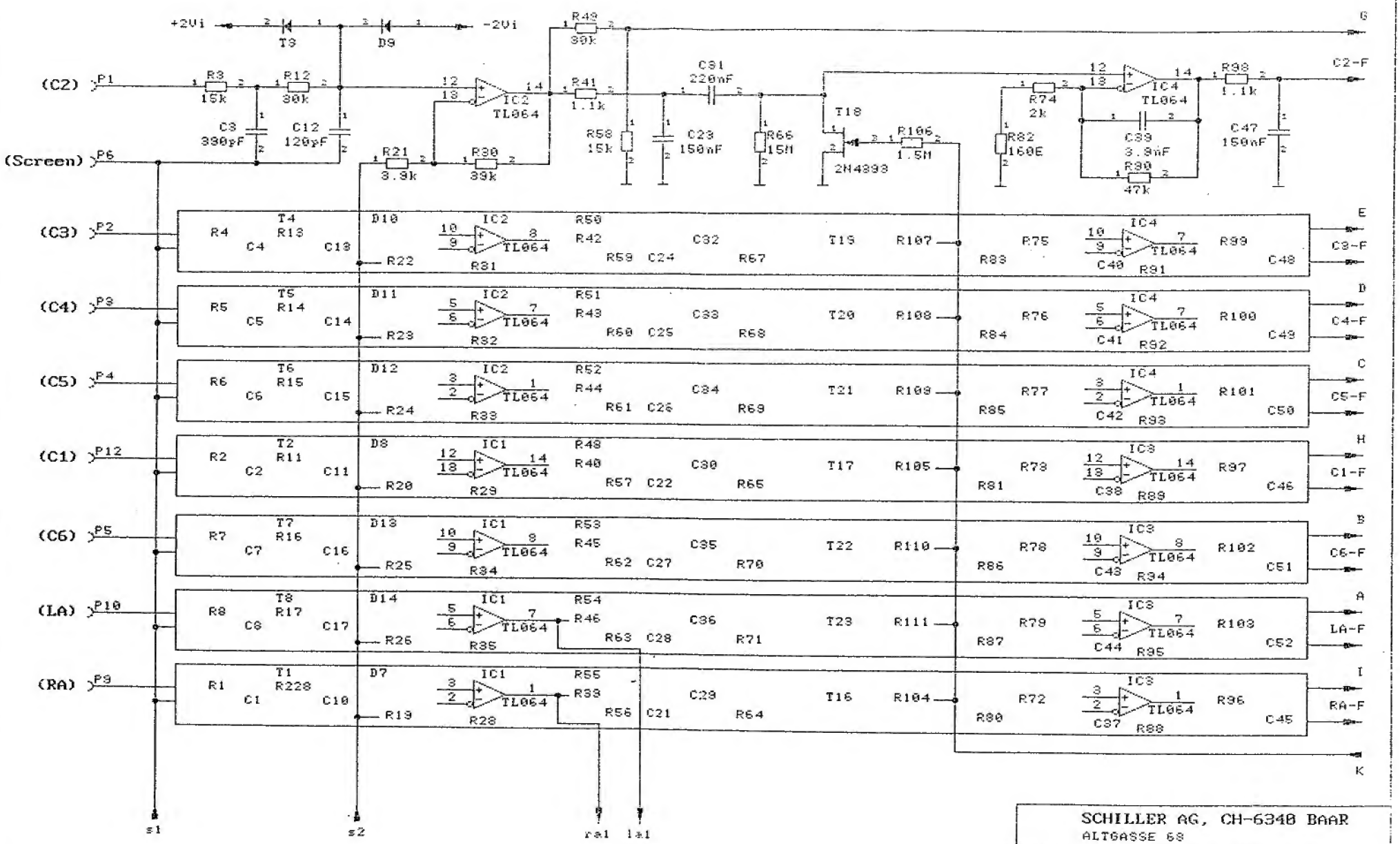
SCHILLER AG, CH-6340 BAAR ALTGASSE 68			
TITLE: EKG AMPLIFIER MK1-2A			
SIZE: B	CODE:	NUMBER: 1100201 A1	REV: A
DATE: 25.SEPT. 1986		SHEET:	



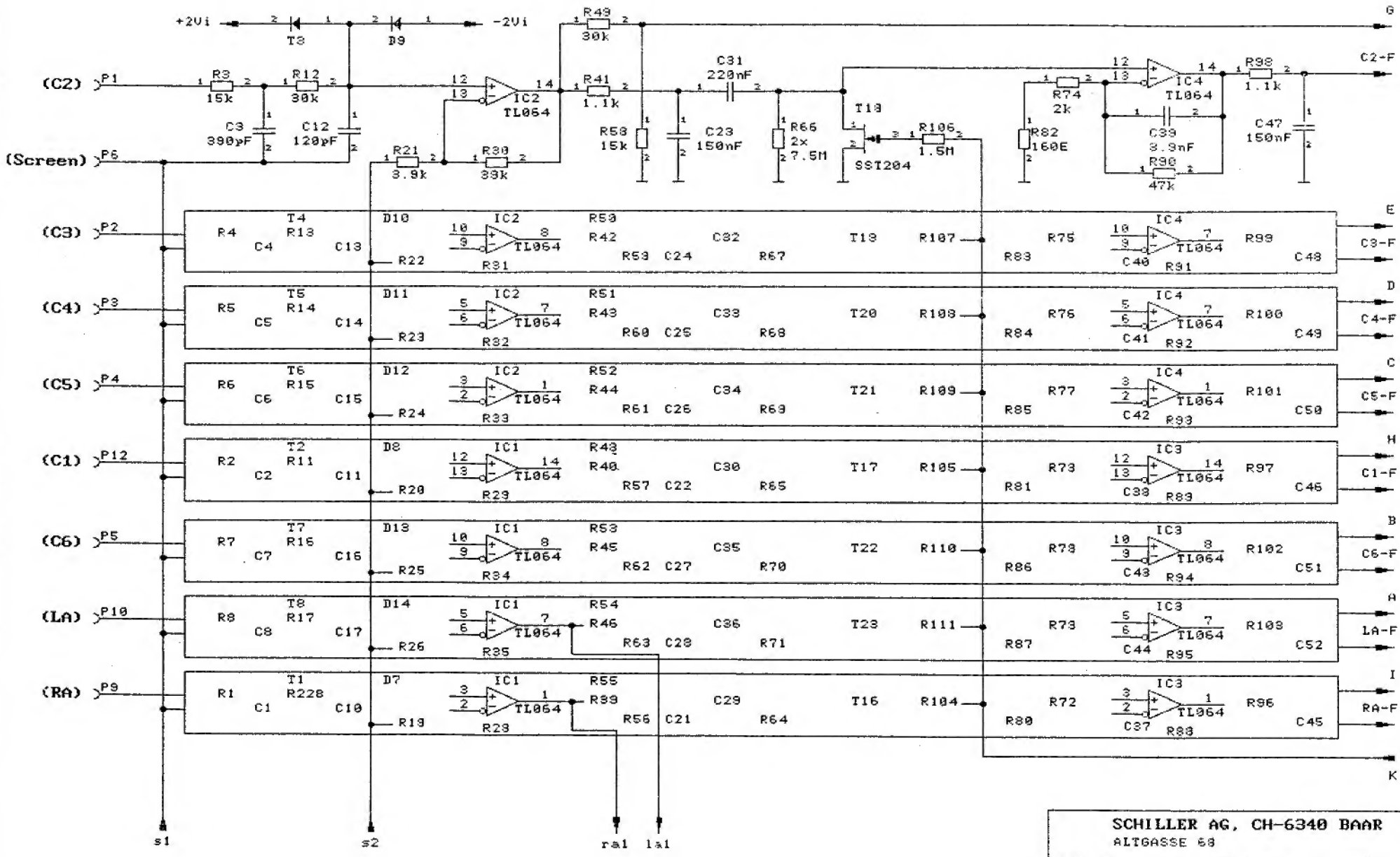
SCHILLER AG, CH-6340 BAAR ALTGASSE 68			
TITLE: EKG AMPLIFIER MK1-2A			
SIZE: B	CODE:	NUMBER: 1100201 A1	REV: A
DATE: 25.SEPT.1986		SHEET:	



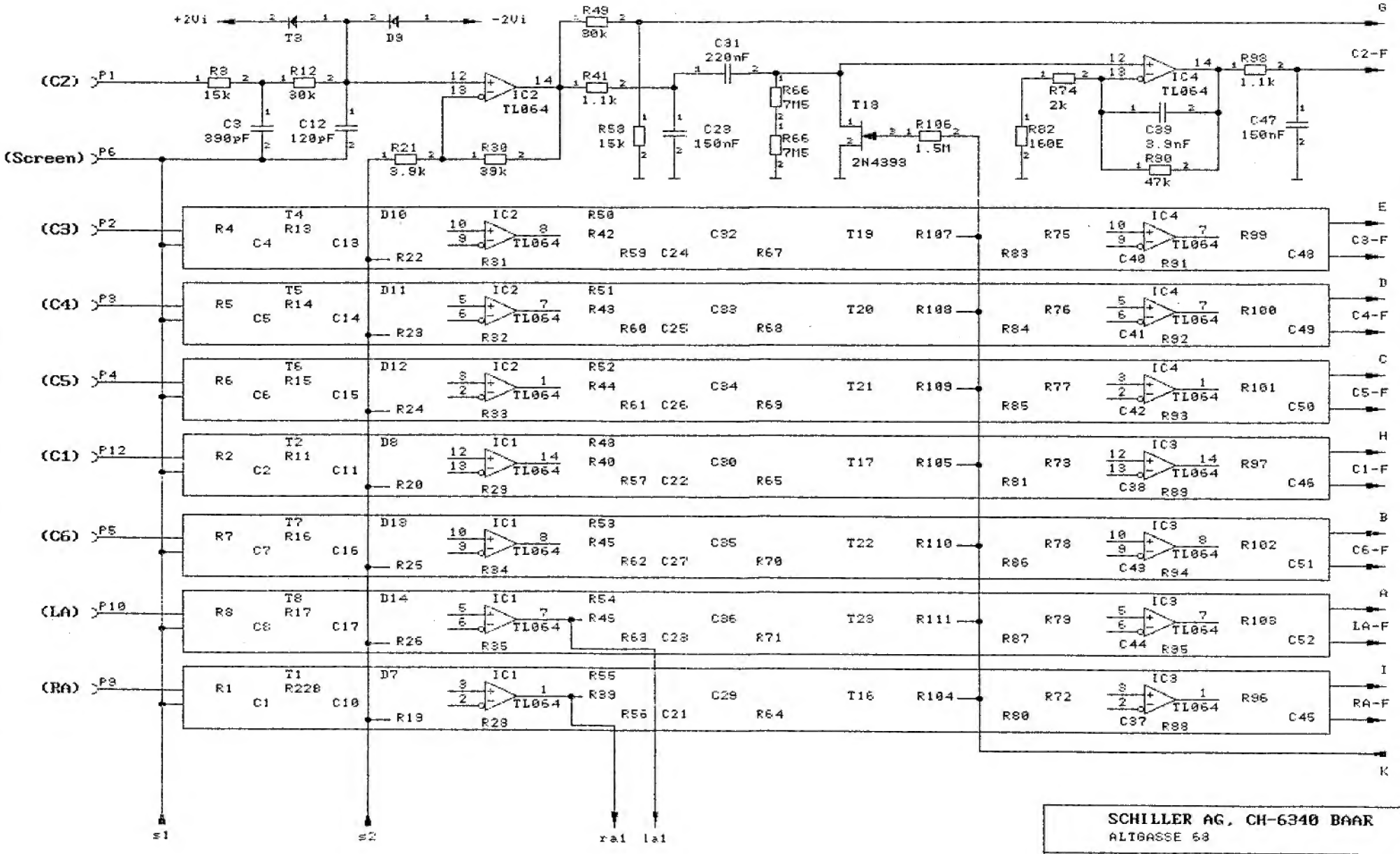
SCHILLER AG, CH-6340 BAAR ALTGASSE 68			
TITLE: EKG AMPLIFIER MK1-2D			
SIZE: B	CODE:	NUMBER: 1200201 A1	REV: A
DATE: 3 JAN 1990		FILE: MK1\M12DAMP1	



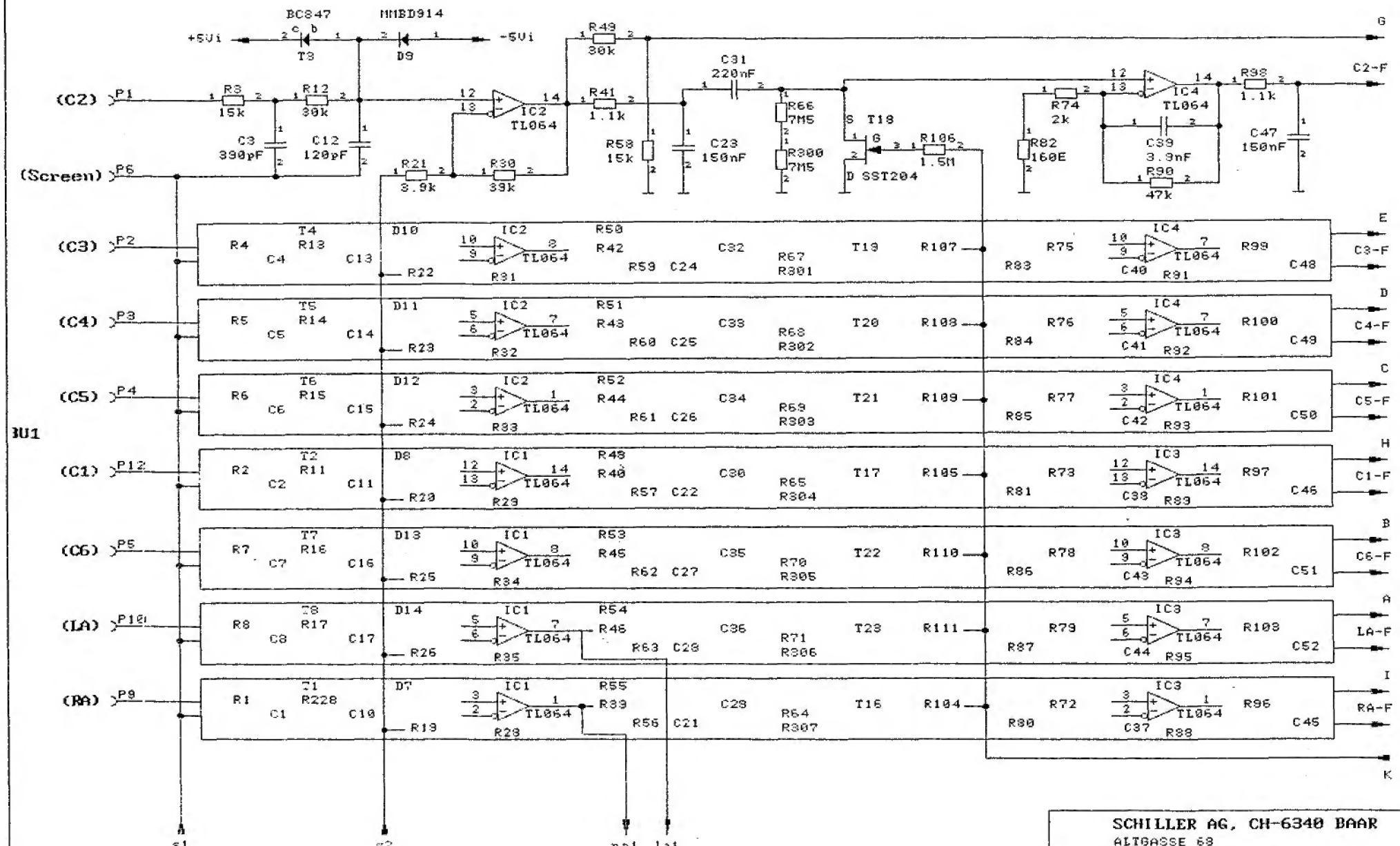
SCHILLER AG, CH-6348 BAAR ALTGASSE 68			
TITLE: EKG AMPLIFIER MK1-2A PART A			
SIZE: B	CODE:	NUMBER: 1100201 A2	REV: A
DATE: 25 SEPT. 1986		SHEET:	

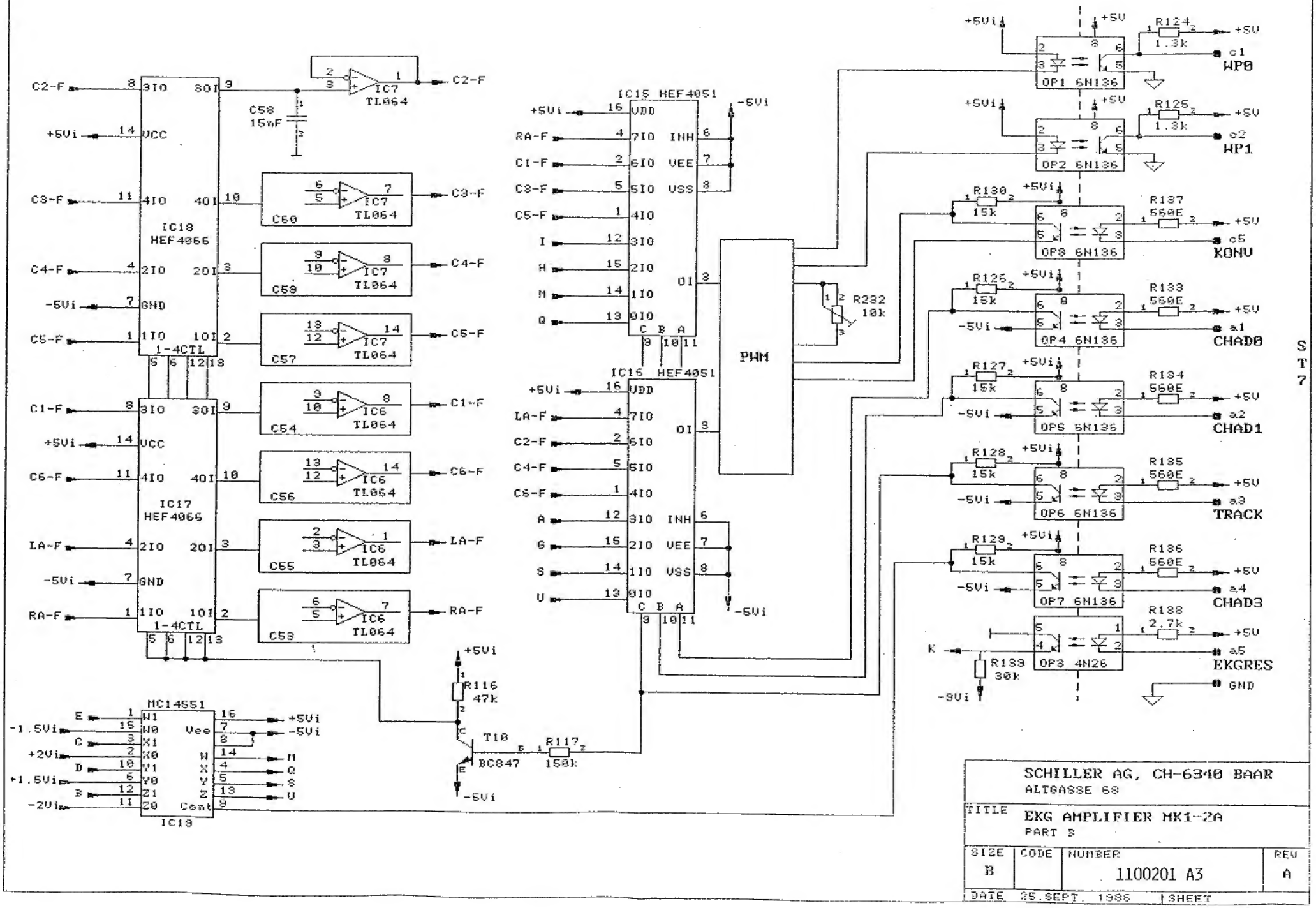


SCHILLER AG, CH-6340 BAAR ALTGASSE 68			
TITLE: EKG AMPLIFIER MK1-2C PART A			
SIZE: B	CODE:	NUMBER: 1100201 A2	REV: A
DATE: 7. DEZ. 1989	/M12CAMP2		



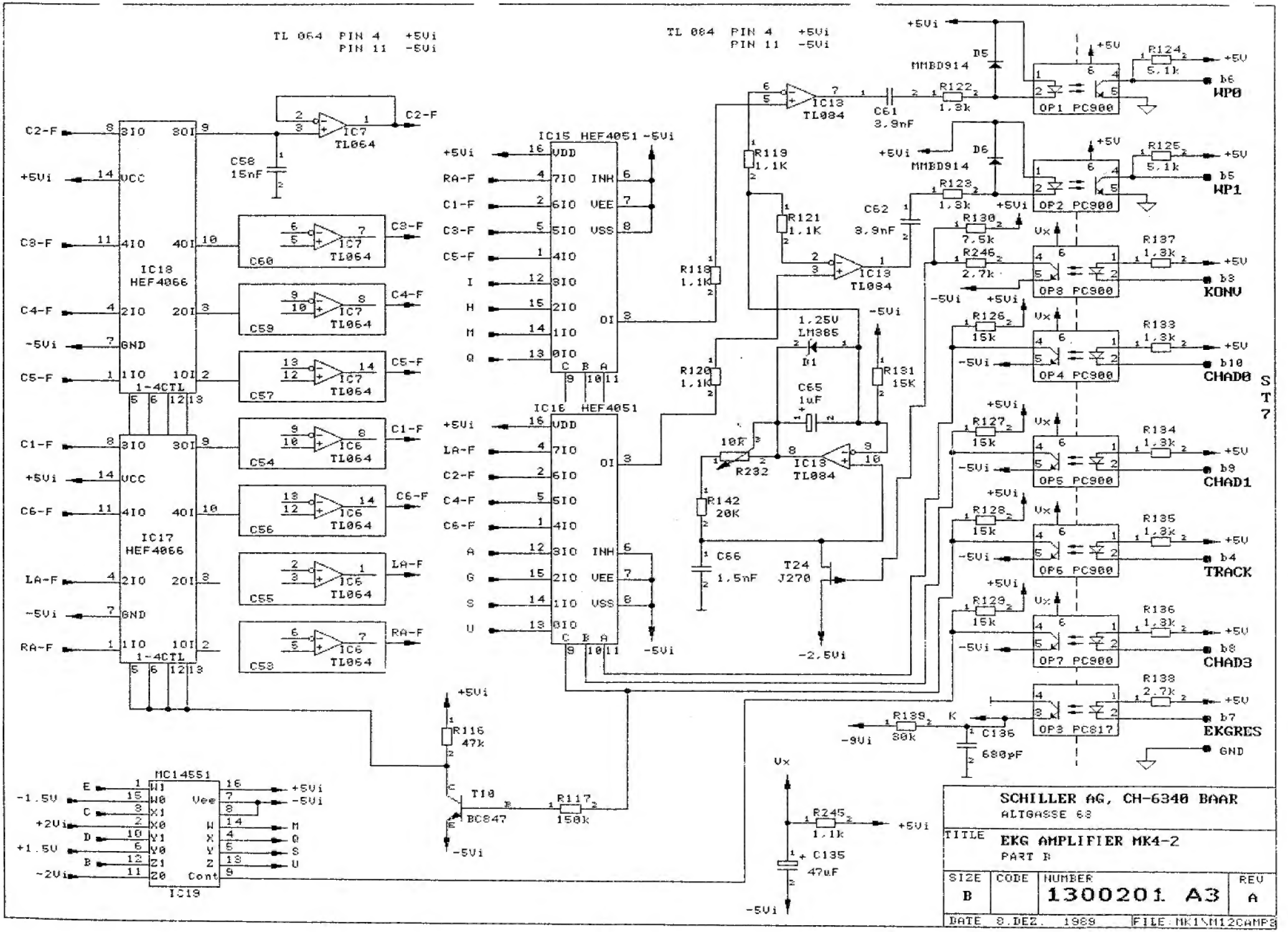
SCHILLER AG, CH-6340 BAAR ALTGASSE 68			
TITLE: EKG AMPLIFIER MK1-2D PART A			
SIZE: B	CODE:	NUMBER: 1100201 A2	REV: A
DATE: 3.JAN. 1990		F:MK1\M12DAMP2	

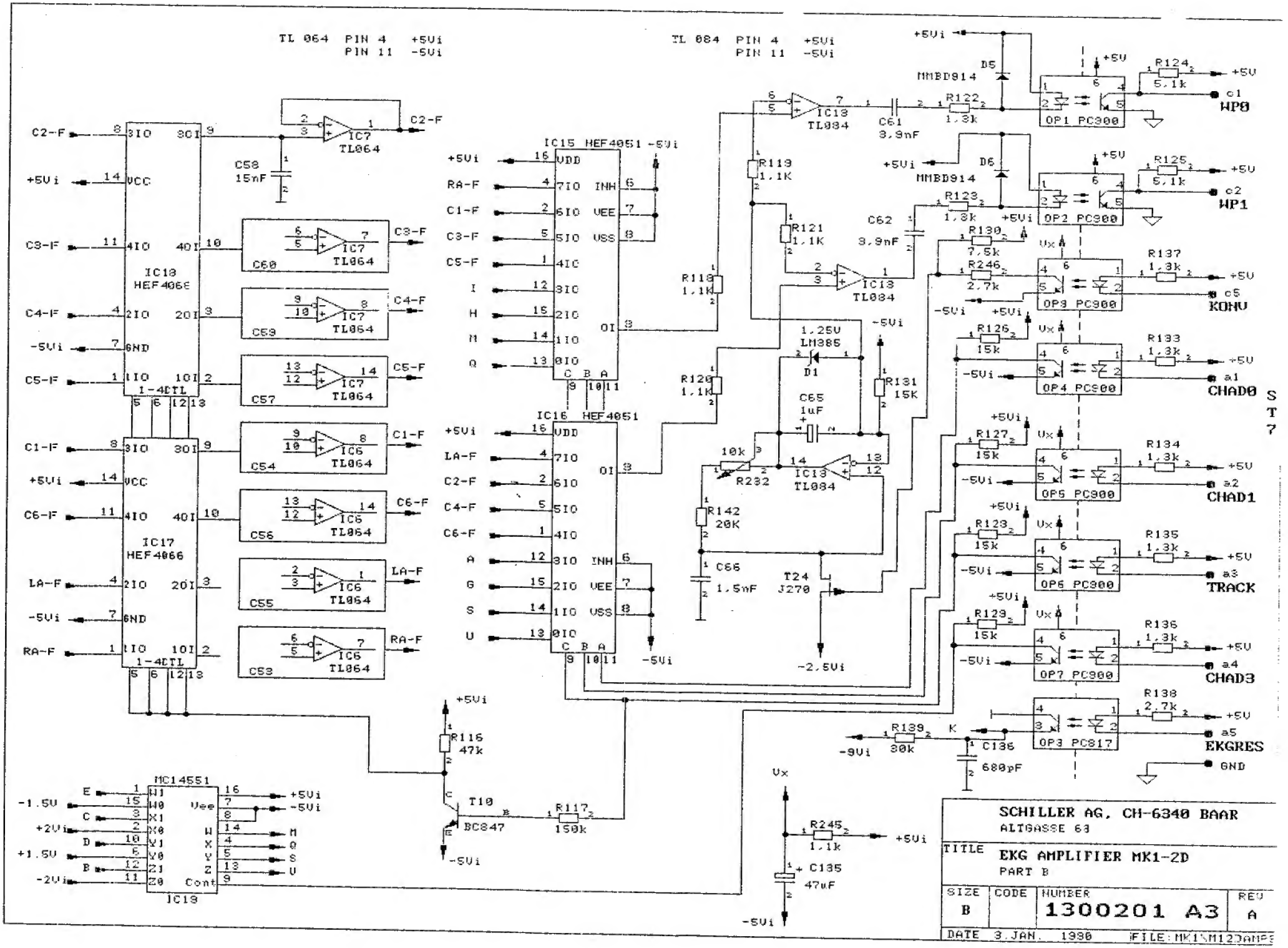

BC847
MMBD914
+5Vi
-5Vi
T3
D9
R49
30k
G
C31
220nF
C2-F
(C2)
P1
R3
15k
R12
30k
IC2
TL064
R41
1.1k
R66
7M5
S T18
R74
2k
IC4
TL064
R98
1.1k
C3
390pF
C12
120pF
R58
15k
C23
150nF
R300
7M5
R106
1.5M
R82
160E
C39
3.9nF
C47
150nF
(Screen)
P6
R21
3.9k
R30
39k
D SST204
R90
47k
(C3)
P2
E
C3-F
(C4)
P3
D
C4-F
(C5)
P4
C
C5-F
BU1
(C1)
P12
H
C1-F
(C6)
P5
B
C6-F
(LA)
P10
A
LA-F
(RA)
P9
I
RA-F
K
s1
s2
ra1
la1
SCHILLER AG, CH-6340 BAAR
ALTGASSE 68
TITLE
EKG AMPLIFIER MK1-2F
PART A
SIZE
B
CODE
NUMBER
1100201 A2
REV
A
DATE
4 JULI 1996
F:\MK1\MK12ANP2

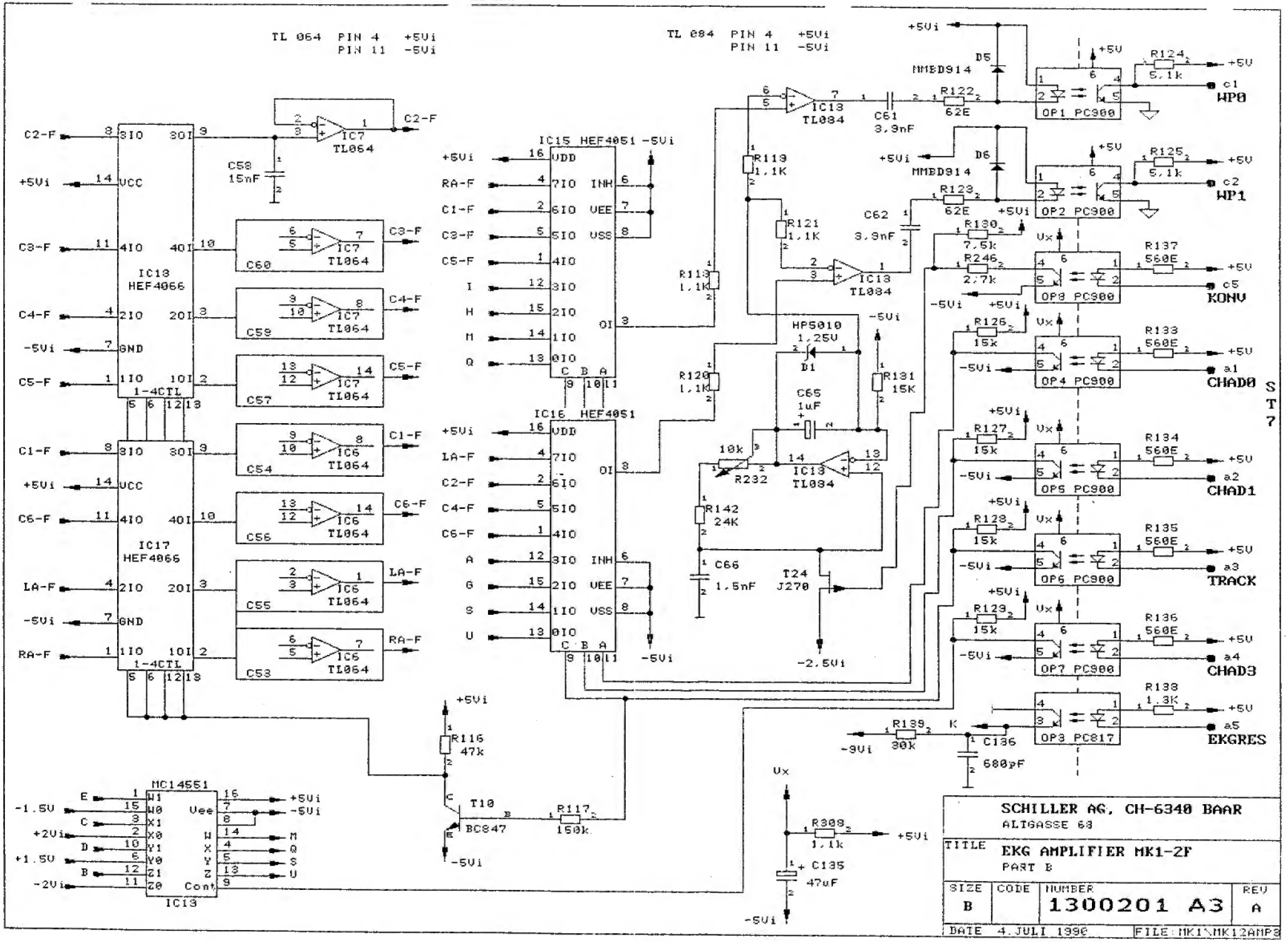


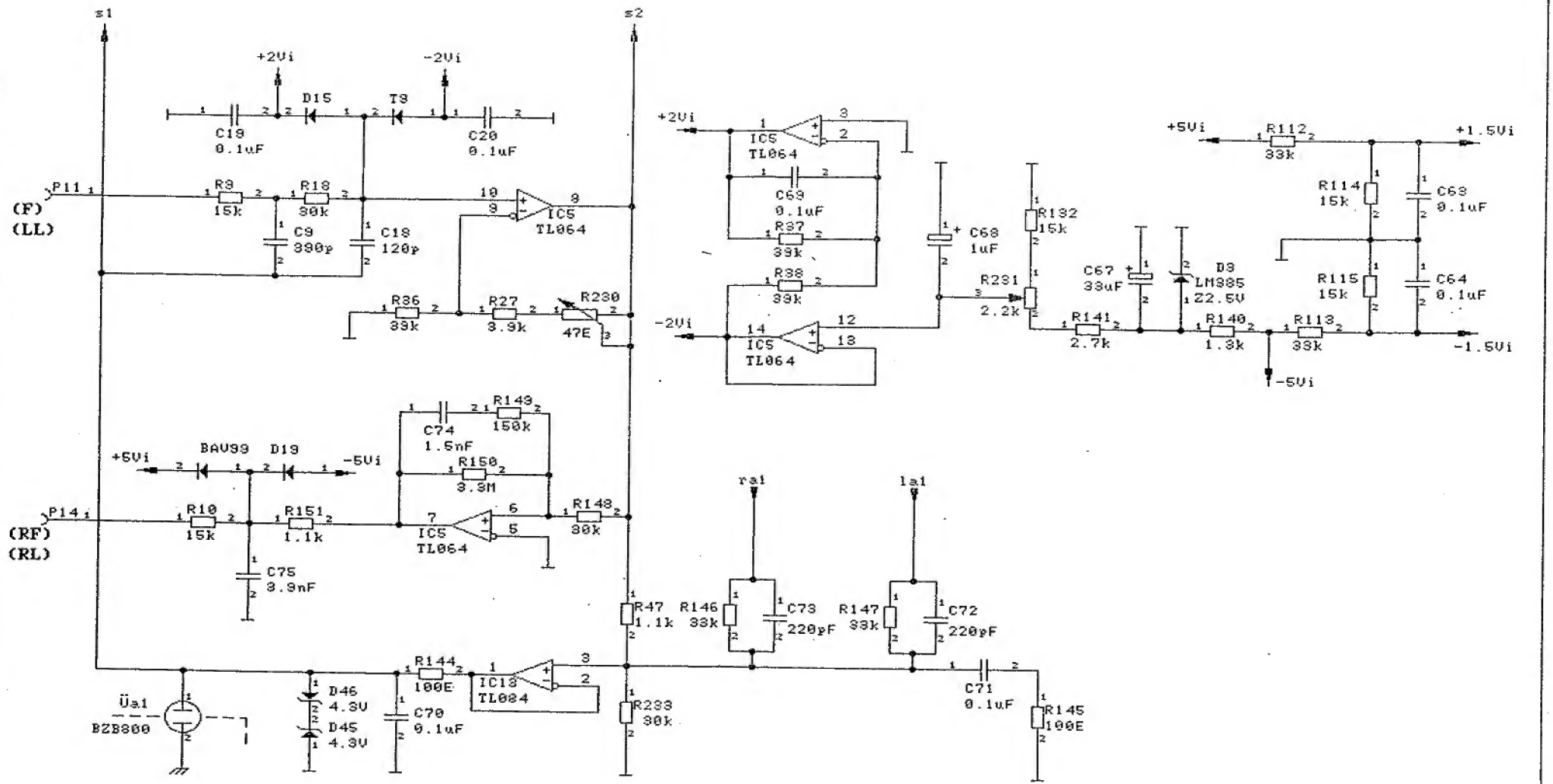
SCHILLER AG, CH-6340 BAAR
ALTGASSE 68

TITLE	EKG AMPLIFIER MK1-2A PART B		
SIZE	CODE	NUMBER	REV
B		1100201 A3	A
DATE 25.SEPT. 1986		SHEET	

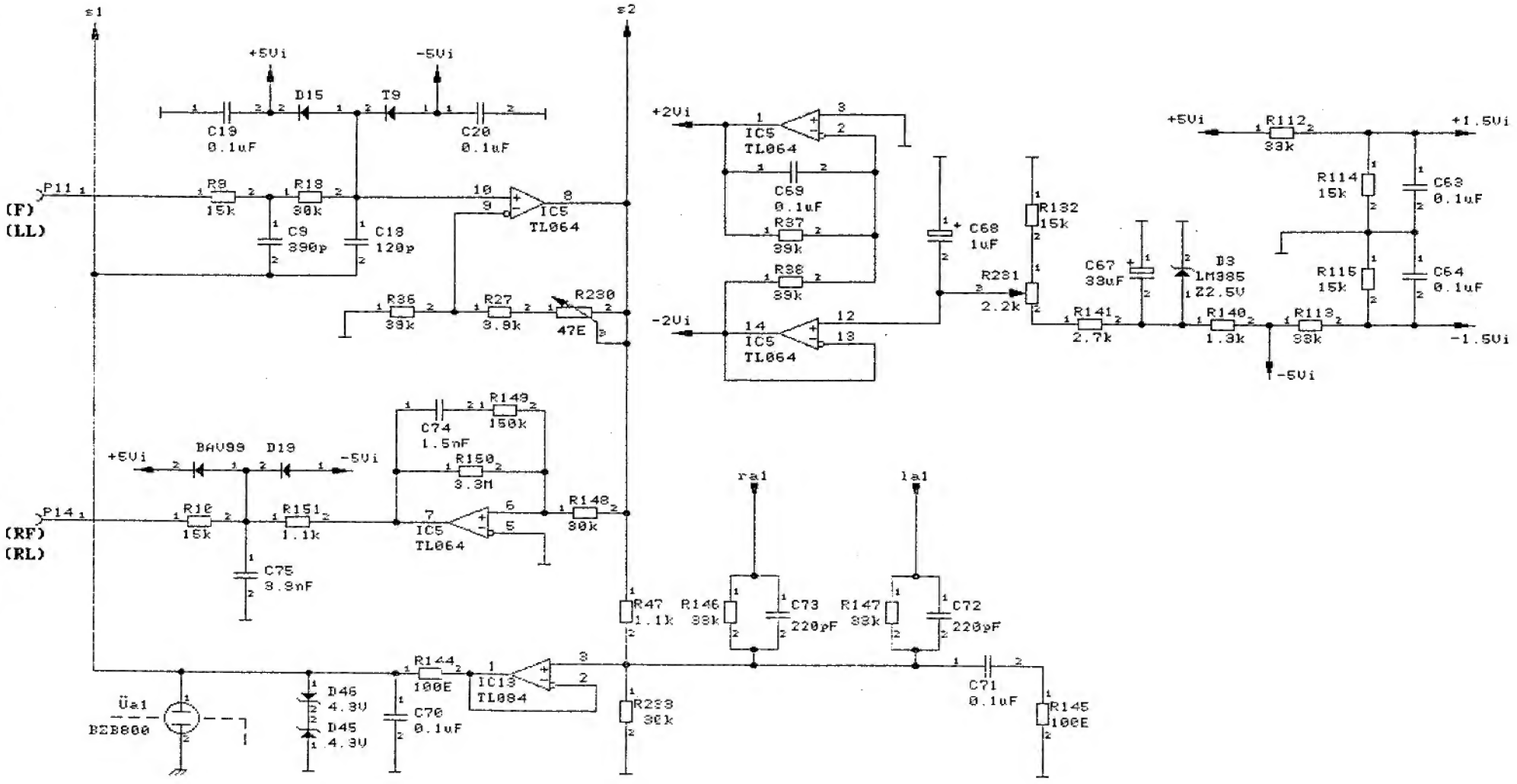

TL 064 PIN 4 +5Vi
PIN 11 -5Vi
TL 084 PIN 4 +5Vi
PIN 11 -5Vi
IC18 HEF4066
IC17 HEF4066
IC15 HEF4051
IC16 HEF4051
IC19 MC14551
1-4CTL
TL064
TL084
LM385
MMBD914
BC847
J270
OP1 PC900
OP2 PC900
OP8 PC900
OP4 PC900
OP5 PC900
OP6 PC900
OP7 PC900
OP3 PC817
WP0
WP1
KONV
CHAD0
CHAD1
TRACK
CHAD3
EKGRES
GND
SCHILLER AG, CH-6340 BAAR
ALTGASSE 68
TITLE EKG AMPLIFIER MK4-2
PART B
SIZE B
CODE
NUMBER 1300201. A3
REV A
DATE 8.DEZ. 1989
FILE MK1\M12CAMP3


TL 064 PIN 4 +5Vi
PIN 11 -5Vi
TL 084 PIN 4 +5Vi
PIN 11 -5Vi
IC18 HEF4066
IC17 HEF4066
IC15 HEF4051
IC16 HEF4051
MC14551
IC19
TL064
TL084
MMBD914
LM385
BC847
J270
OP1 PC900
OP2 PC900
OP3 PC900
OP4 PC900
OP5 PC900
OP6 PC900
OP7 PC900
OP3 PC817
WP0
WP1
KONU
CHAD0
CHAD1
TRACK
CHAD3
EKGRES
GND
SCHILLER AG, CH-6340 BAAR
ALTGASSE 63
EKG AMPLIFIER MK1-2D
PART B
1300201 A3
DATE 3.JAN. 1990

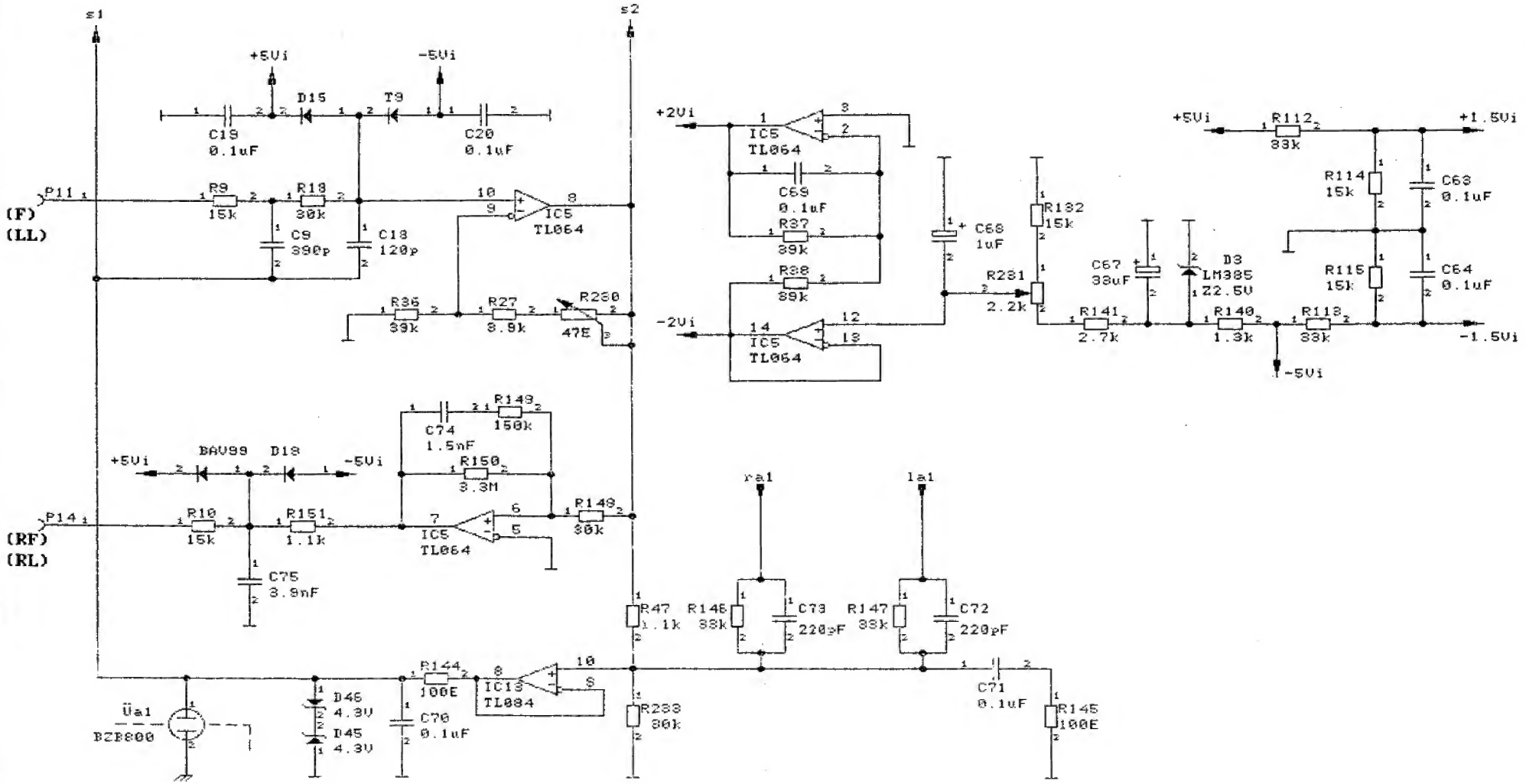

TL 064 PIN 4 +5Vi
PIN 11 -5Vi
TL 084 PIN 4 +5Vi
PIN 11 -5Vi
IC18 HEF4066
IC17 HEF4066
IC15 HEF4051 -5Vi
IC16 HEF4051
MC14551
IC13
SCHILLER AG, CH-6340 BAAR
ALIGASSE 68
TITLE EKG AMPLIFIER MK1-2F
PART B
SIZE B
CODE
NUMBER 1300201 A3
REV A
DATE 4.JULI 1990
FILE MK1\MK12AMP3
ST7



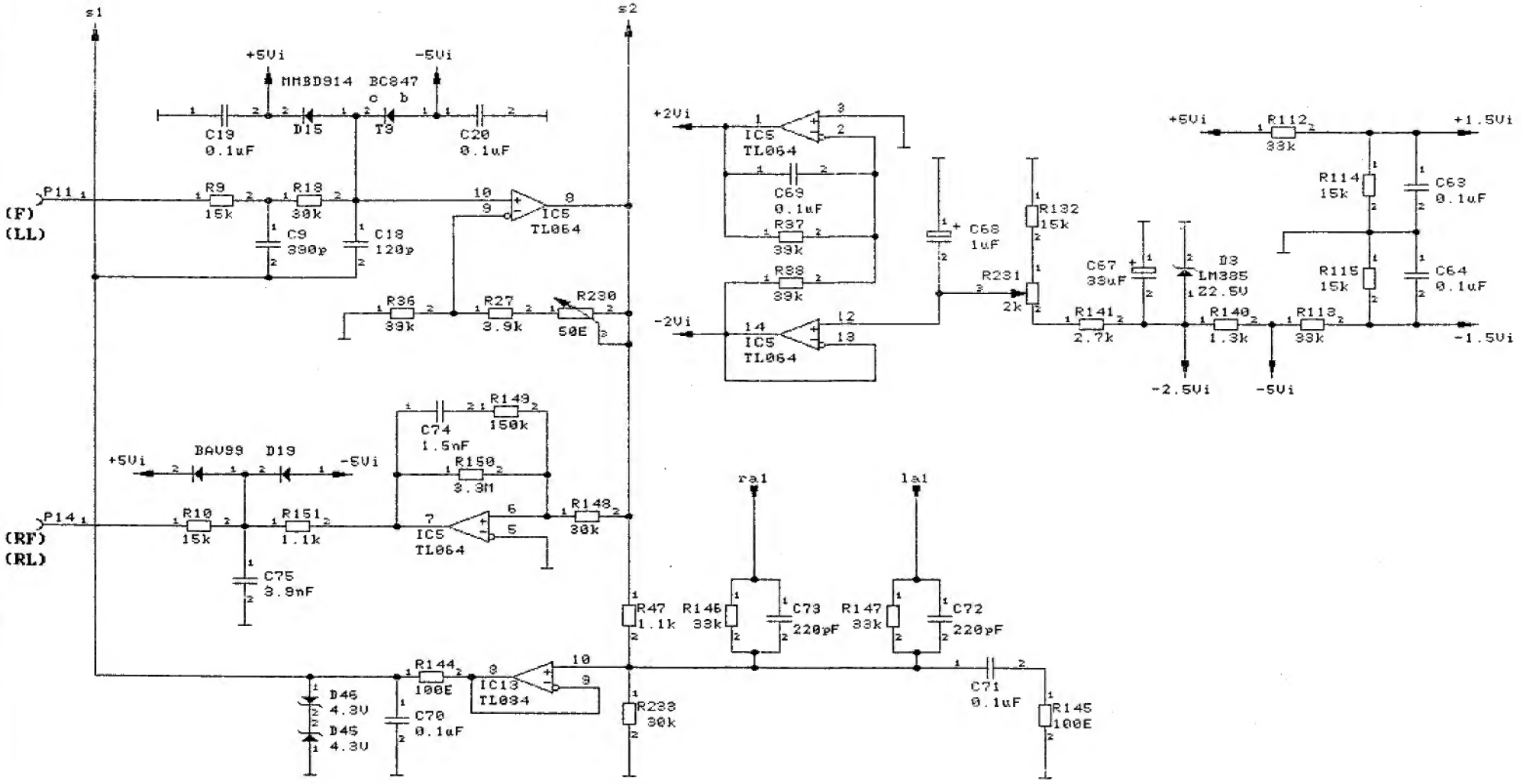
SCHILLER AG, CH-6340 BAAR ALTGASSE 68			
TITLE: EKG AMPLIFIER MK1-2A PART C			
SIZE: B	CODE:	NUMBER: 1100201 A4	REV: A
DATE: 25.SEPT. 1986		SHEET:	



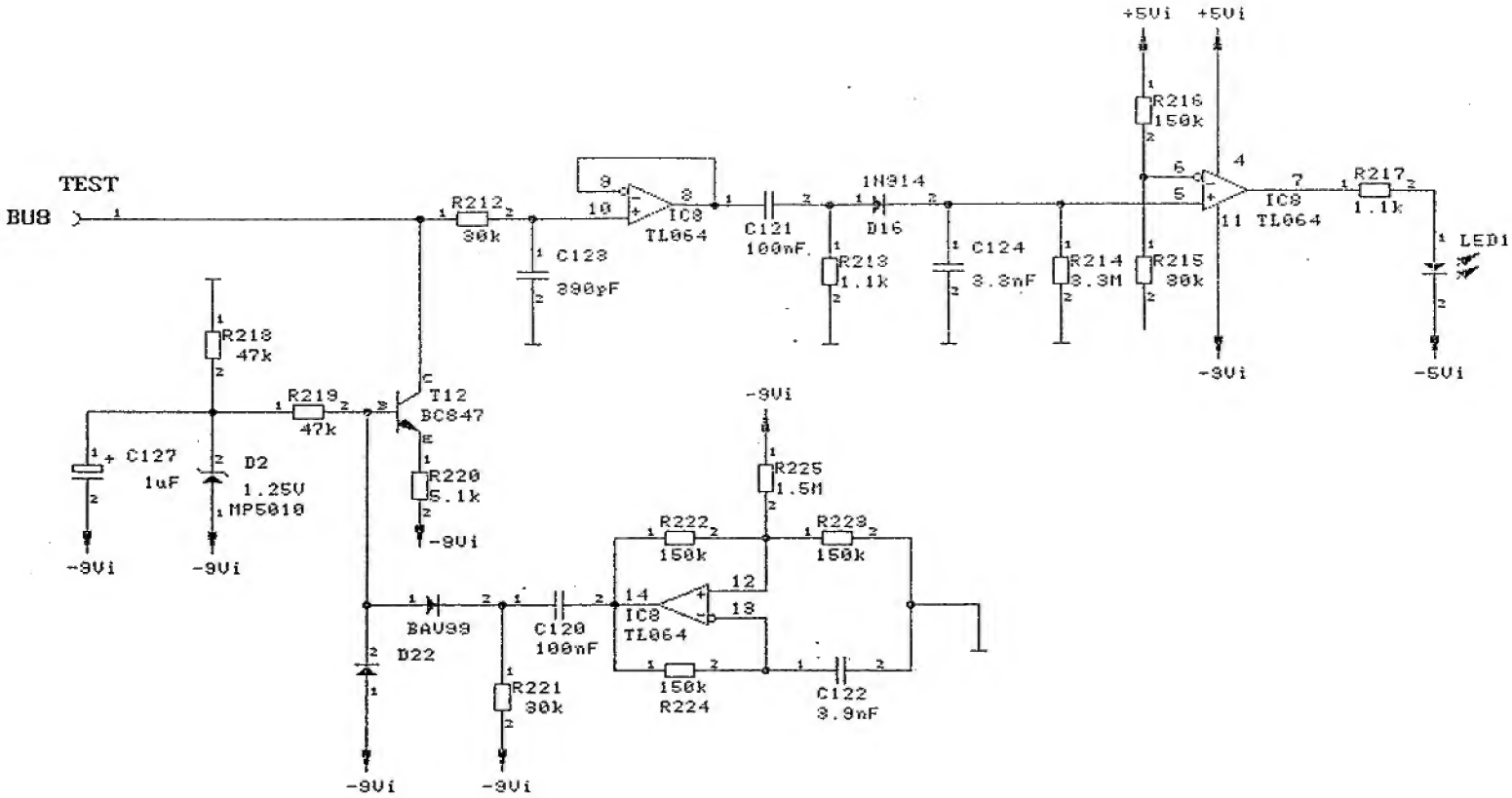
SCHILLER AG, CH-6340 BAAR ALTGASSE 68			
TITLE: EKG AMPLIFIER MK1-2A PART C			
SIZE: B	CODE:	NUMBER: 1100201 A4	REV: A
DATE: 3.FEB.1987		SHEET:	



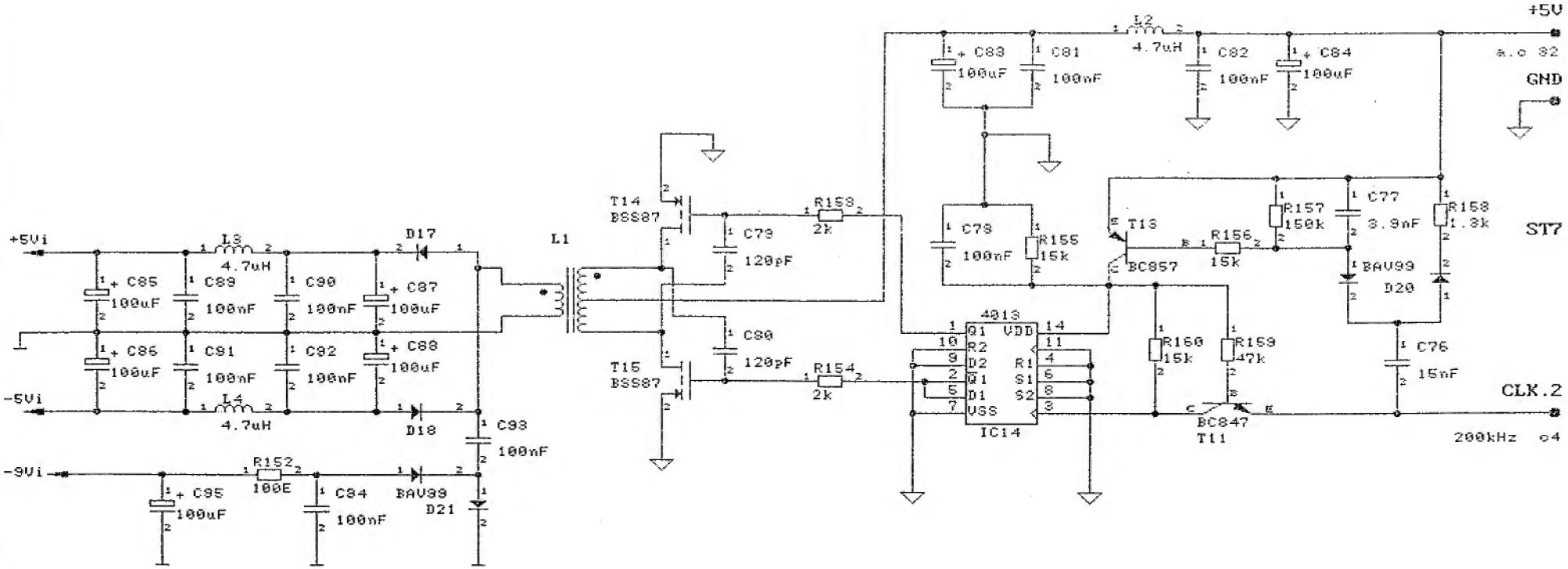
SCHILLER AG, CH-6340 BAAR ALTGASSE 68			
TITLE: EKG AMPLIFIER MK1-2D PART C			
SIZE: B	CODE:	NUMBER: 1100201 A4	REV: A
DATE: 8.JAN.1990		F:MK1\M12DAMP4	



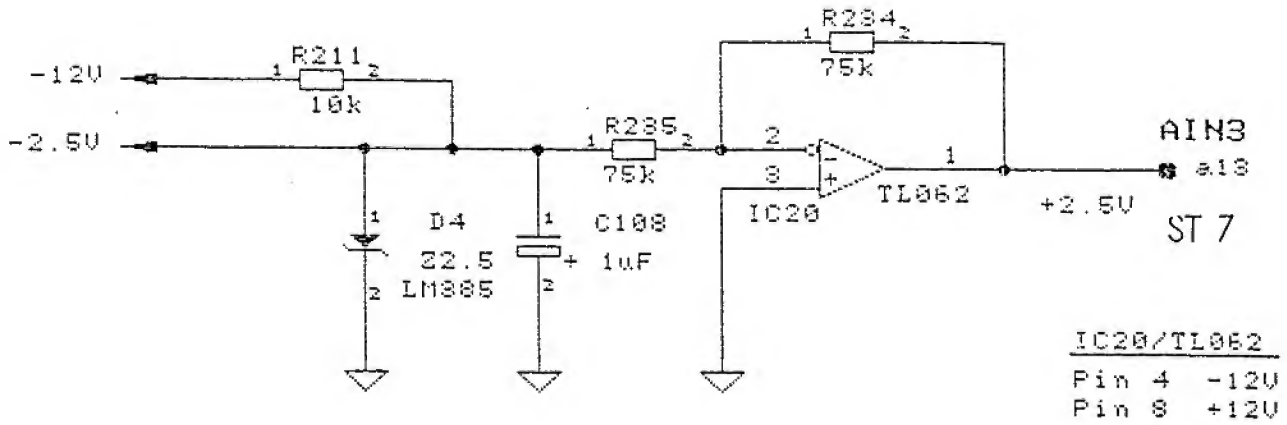
SCHILLER AG, CH-6340 BAAR ALTGASSE 68			
TITLE: EKG AMPLIFIER MK1-2F PART C			
SIZE: B	CODE:	NUMBER: 1100201 A4	REV: A
DATE: 4. JULI 1990		F:MK1\MK12AMP4	

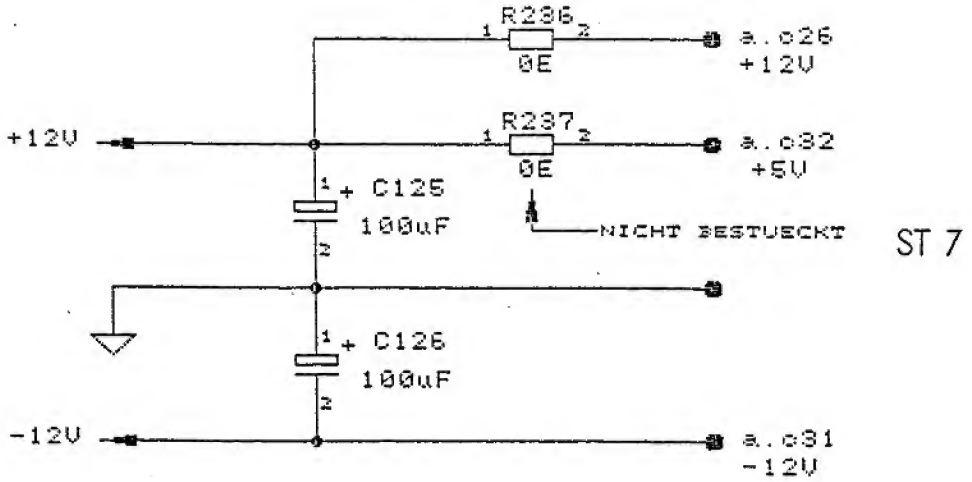


SCHILLER AG, CH-6348 BAAR ALTGASSE 68			
TITLE: EKG AMPLIFIER MK1--2A CABLE TESTER			
SIZE: B	CODE:	NUMBER: 1100201 A5	REV: A
DATE: 25.SEPT. 1986		SHEET:	

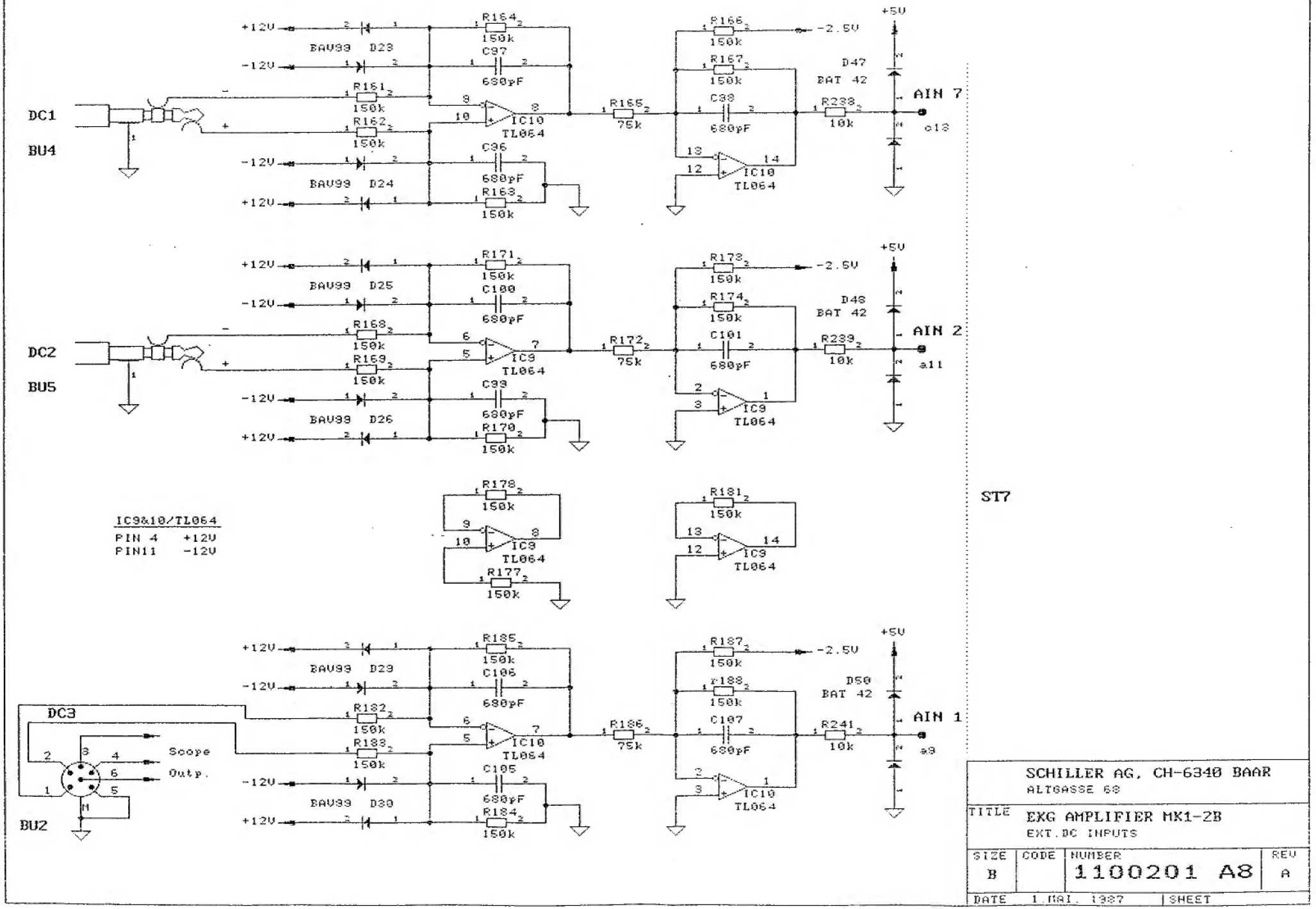


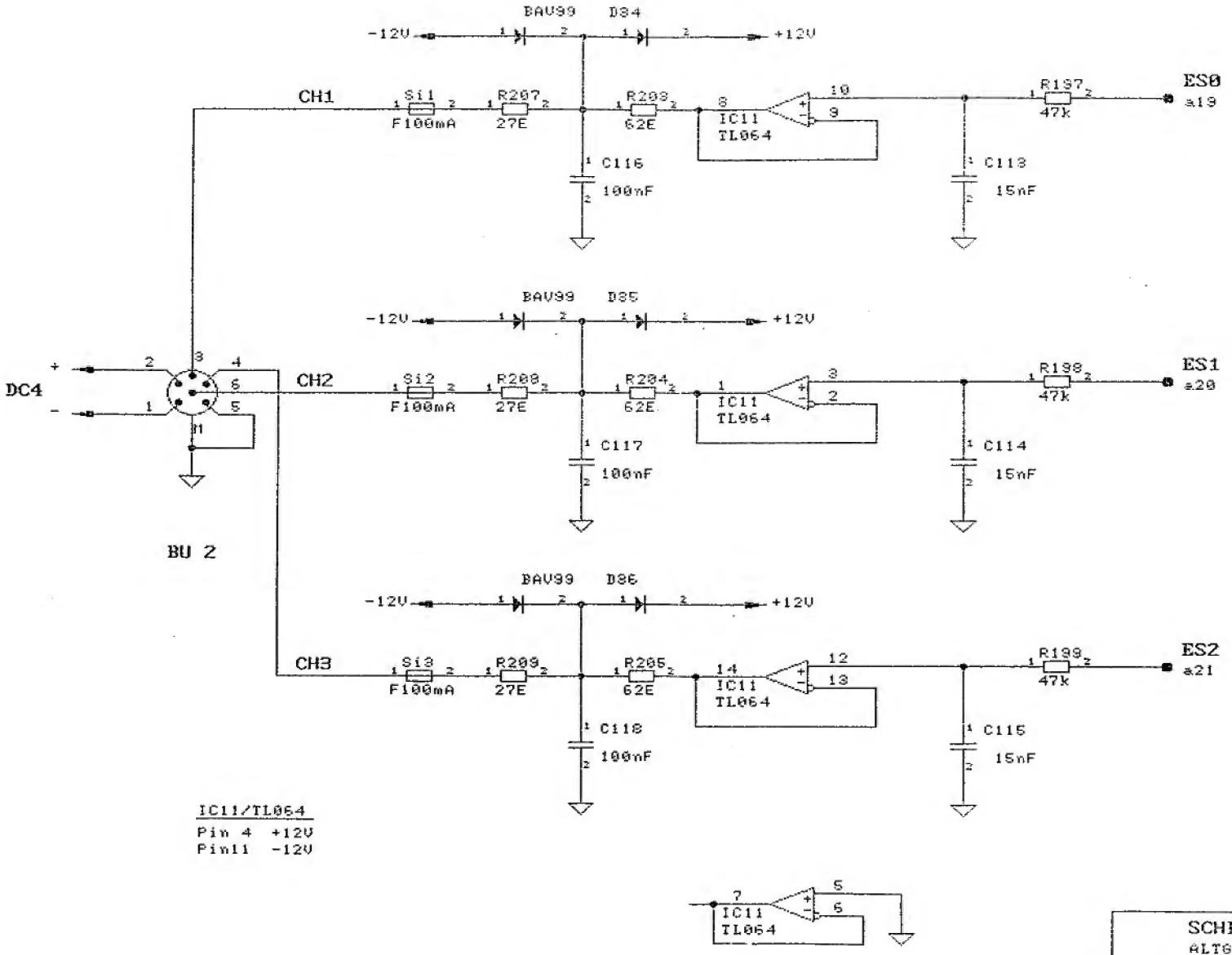
SCHILLER AG, CH-6348 BAAR ALTGASSE 68			
TITLE: EKG AMPLIFIER MK1-2A DC-DC CONVERTER			
SIZE: B	CODE:	NUMBER: 1100201 A6	REV: A
DATE: 25.SEPT. 1986		SHEET	



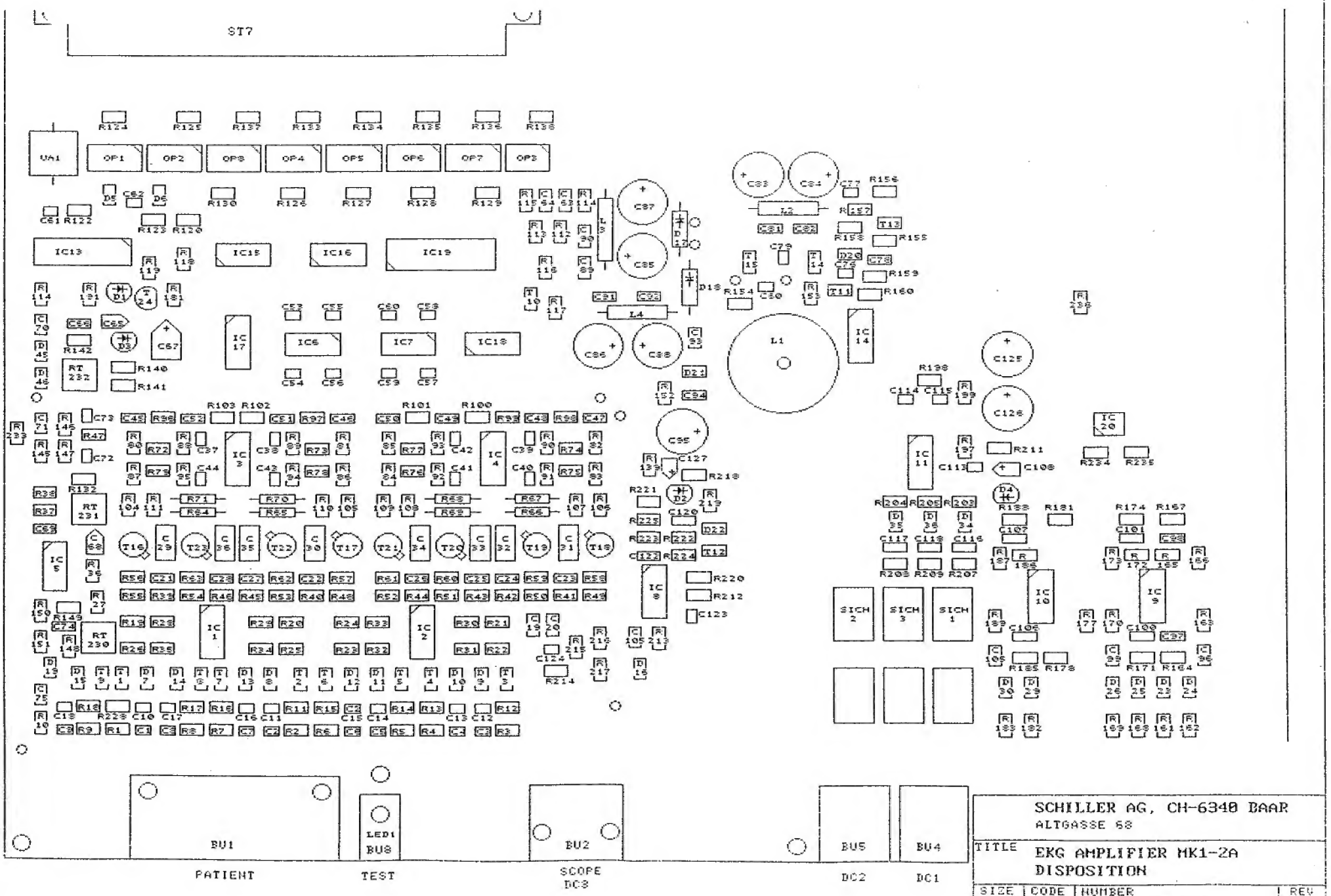


SCHILLER AG, CH-6340 BAAR ALTGASSE 68			
TITLE: EKG AMPLIFIER MK1-2(A) -2.5V/+2.5V REF			
SIZE: B	CODE:	NUMBER: 1100201 A7	REV: A
DATE: 25.SEPT. 1986		SHEET:	


DC1
BU4
DC2
BU5
DC3
BU2
Scope
Outp.
+12V
-12V
-2.5V
+5V
BAV99 D23
BAV99 D24
BAV99 D25
BAV99 D26
BAV99 D29
BAV99 D30
R161 150k
R162 150k
R163 150k
R164 150k
R165 75k
R166 150k
R167 150k
R168 150k
R169 150k
R170 150k
R171 150k
R172 75k
R173 150k
R174 150k
R177 150k
R178 150k
R181 150k
R182 150k
R183 150k
R184 150k
R185 150k
R186 75k
R187 150k
R188 150k
C96 680pF
C97 680pF
C98 680pF
C99 680pF
C100 680pF
C101 680pF
C105 680pF
C106 680pF
C107 680pF
IC10 TL064
IC9 TL064
D47 BAT 42
D48 BAT 42
D50 BAT 42
R238 10k
R239 10k
R241 10k
AIN 7
AIN 2
AIN 1
c13
a11
a9
IC9&10/TL064
PIN 4 +12V
PIN11 -12V
ST7
SCHILLER AG, CH-6340 BAAR
ALTGASSE 68
TITLE
EXG AMPLIFIER MK1-2B
EXT.DC INPUTS
SIZE B
CODE
NUMBER 1100201 A8
REV A
DATE 1.MAI. 1987
SHEET

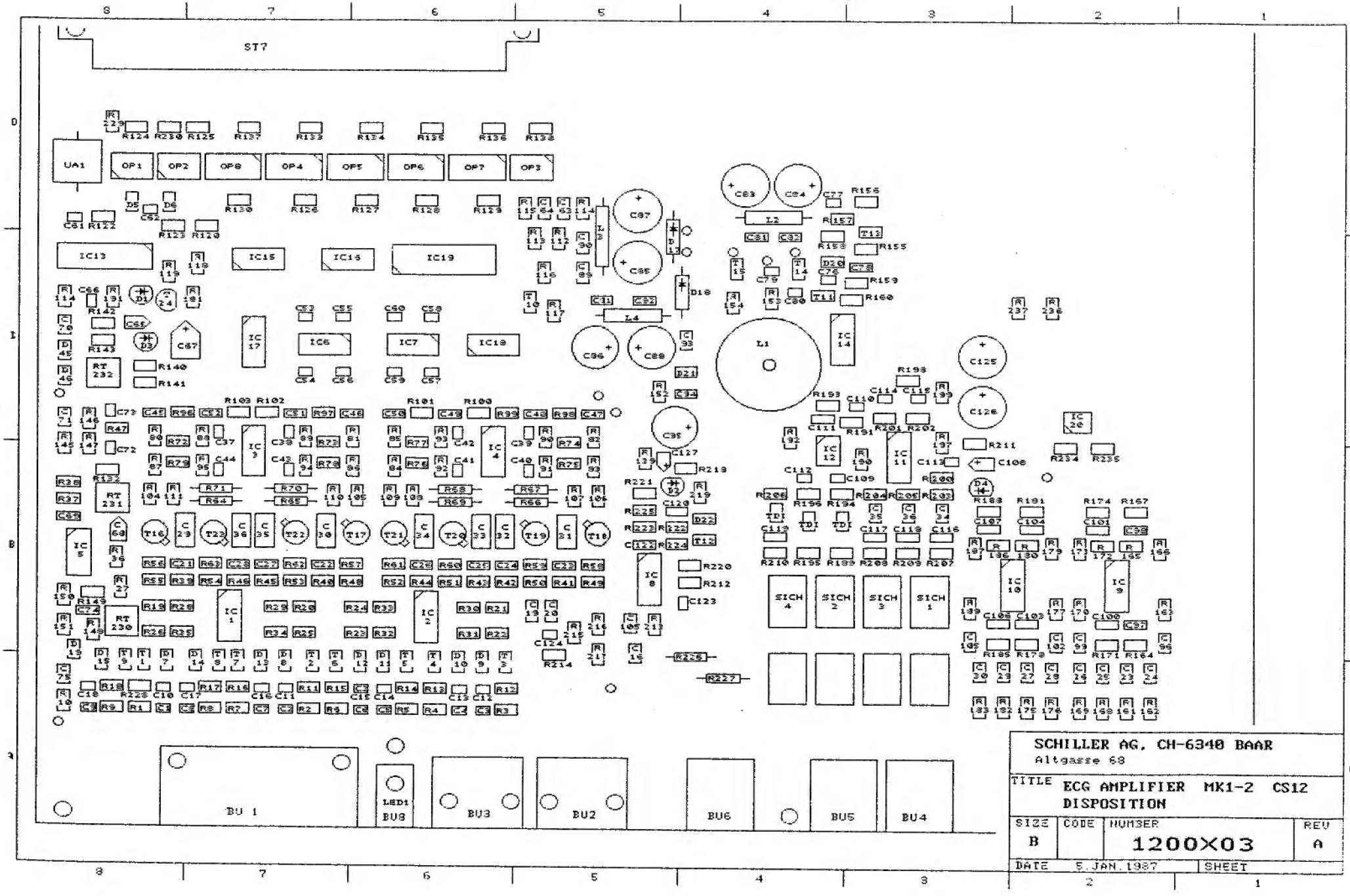


SCHILLER AG, CH-6340 BAAR ALTGASSE 63			
TITLE	EKG AMPLIFIER MX1-2A SCOPE OUTPUT DRIVERS		
SIZE B	CODE	NUMBER 1100201 A9	REV A
DATE 25.SEPT. 1986		SHEET	



SCHILLER AG, CH-6340 BAAR
ALTGASSE 68

TITLE	EKG AMPLIFIER MK1-2A DISPOSITION		
SIZE	CODE	NUMBER	REV
B		1100203	A
DATE	25.SEPT 1986	SHEET	

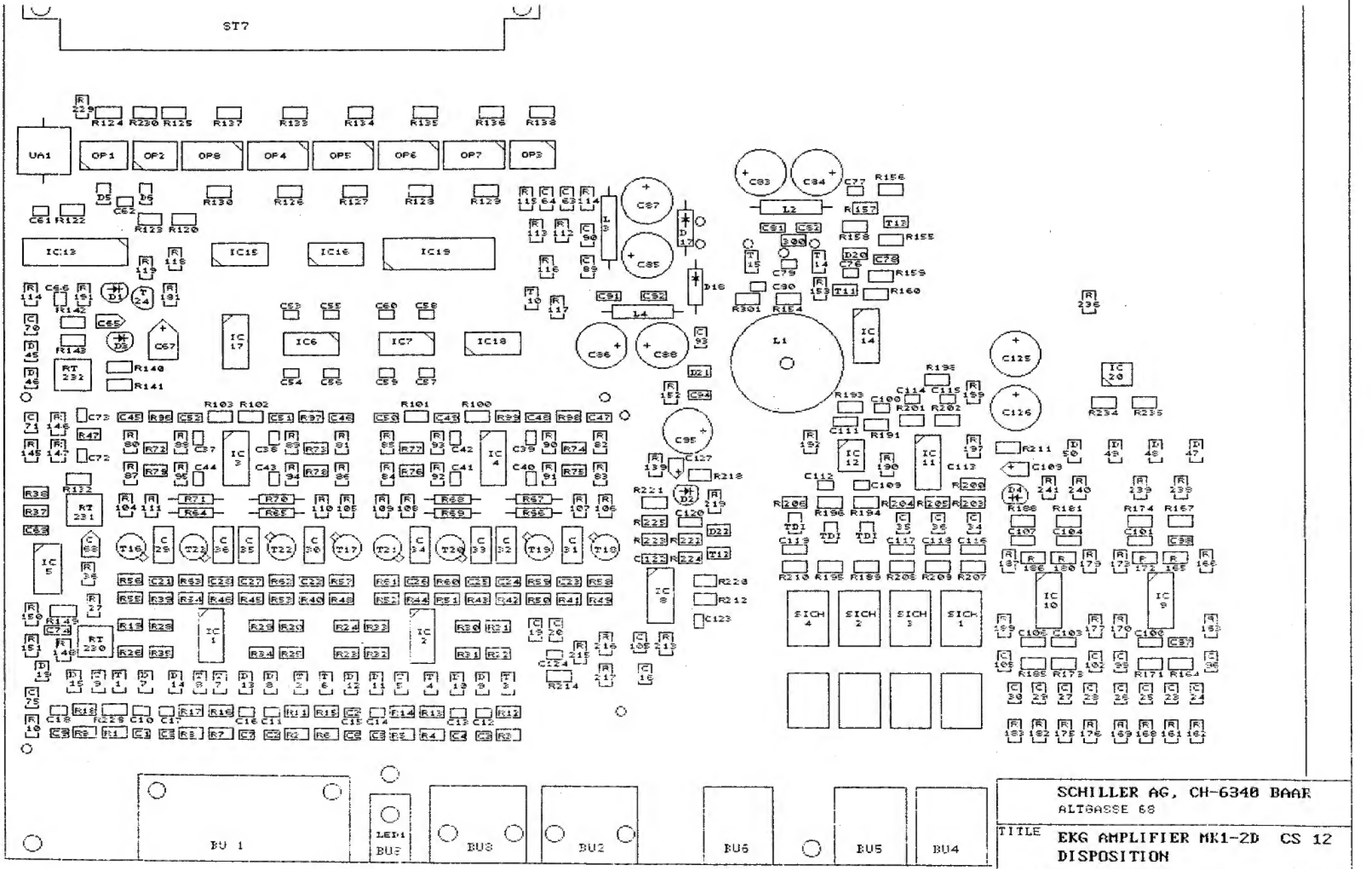


SCHILLER AG, CH-6340 BAAR
Altgasse 68

TITLE ECG AMPLIFIER MK1-2 CS12
DISPOSITION

SIZE	CODE	NUMBER	REV
B		1200X03	A

DATE 5.JAN.1987 SHEET



SCHILLER AG, CH-6340 BAAR
ALTGASSE 68

TITLE: EKG AMPLIFIER MK1-2D CS 12
DISPOSITION

SIZE	CODE	NUMBER	REV
B		1200203	A

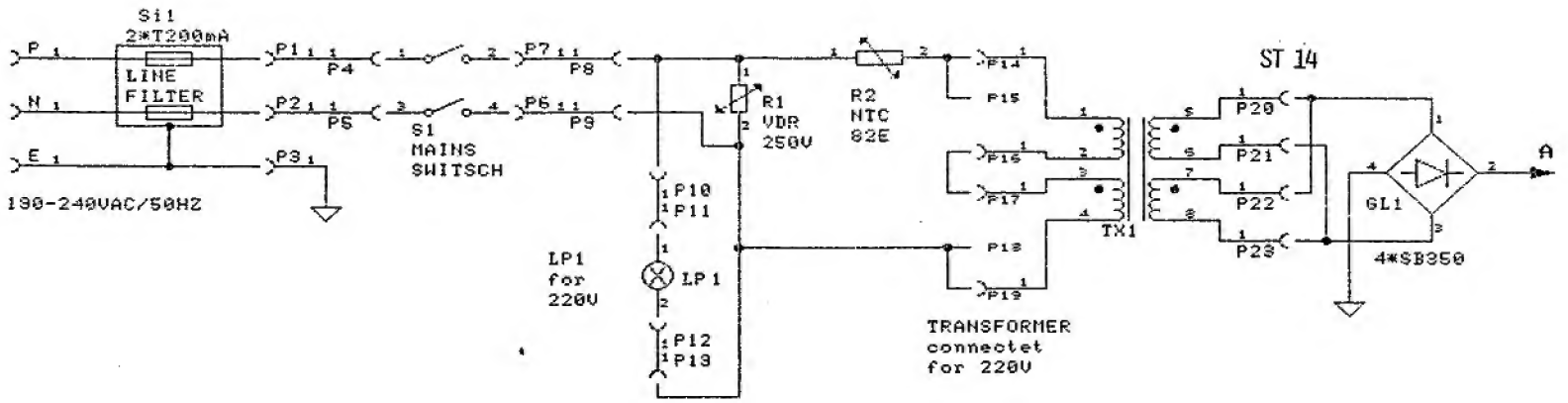
DATE 28.JULI.1989 FILE MK1\MK12D1SP

SECTION 5

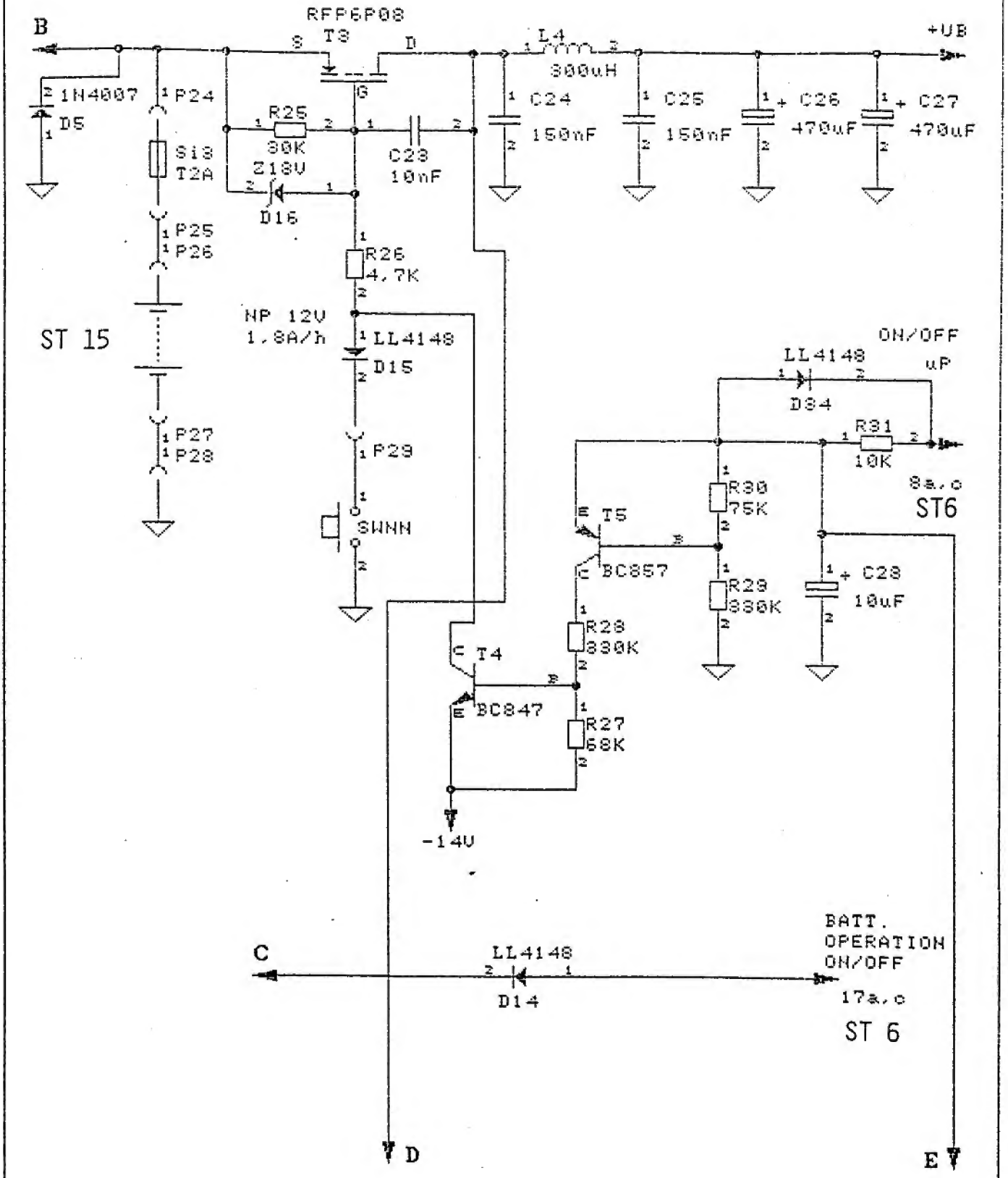
POWER SUPPLY CIRCUIT MK2-6

	Drawing No.
Power Supply - Primary Part	1100601 MA
Power Supply - On / Off Circuitry	1100601 OF
Battery Low Circuitry	1100601 BC
13.8 Vdc Battery Charger	1100601 NR
15 Vdc Supply	1100601
+ / - 12 Vdc Supply	1100601
5 Vdc Supply	1100601
Motor Control	1100601 MC
ST-6 Pinout Disposition	1100601 PIN
Power Supply PCB Layout	1100603

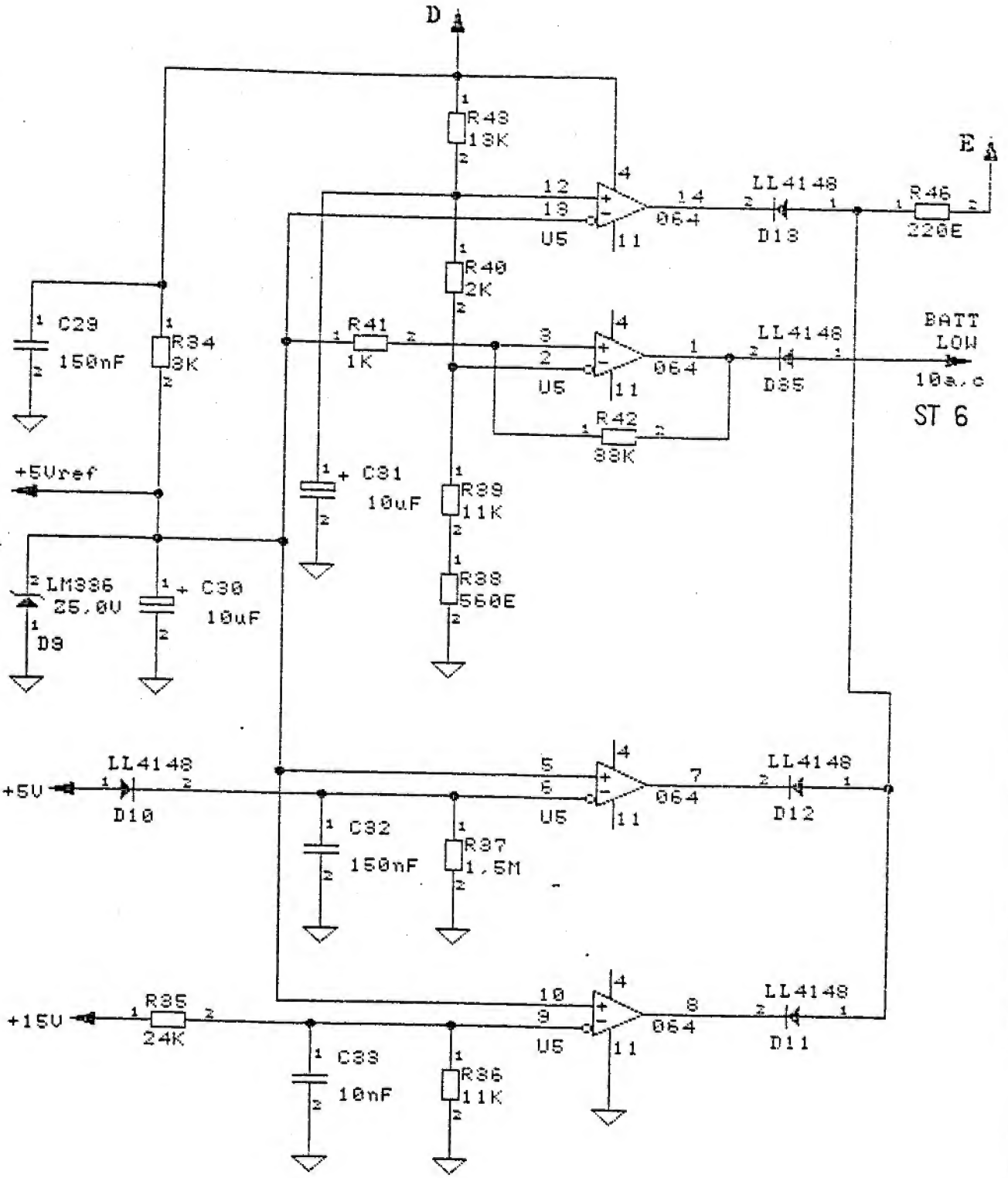
Circuit Theory - AT-6 Power Supply and Charger Circuit



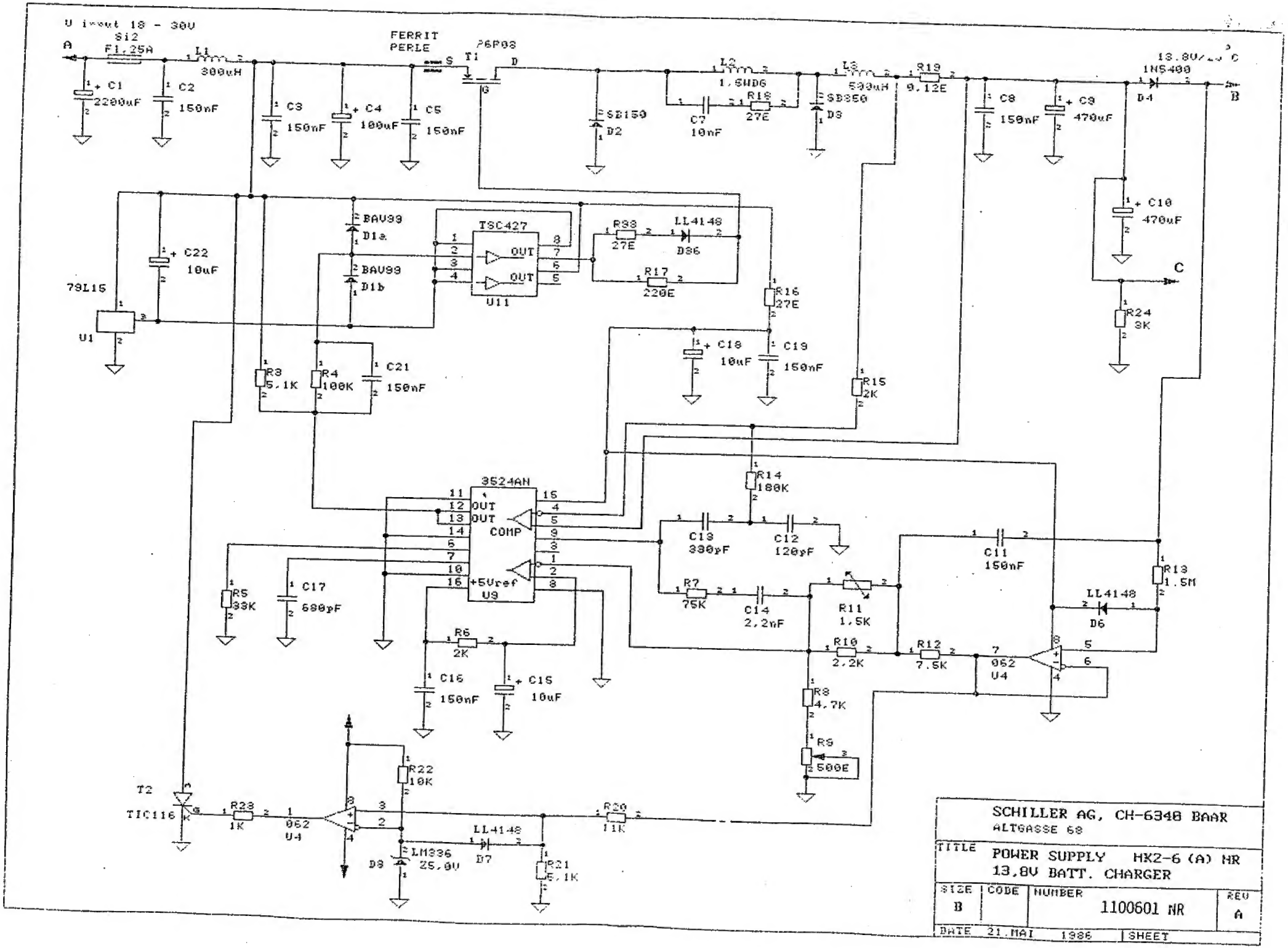
SCHILLER AG, CH-6340 BAAR ALTGASSE 68			
TITLE: POWER SUPPLY MK2-6(A) MA 190-240VAC/50Hz			
SIZE: B	CODE:	NUMBER: 1100601 MA	REV: A
DATE: 21.MAI 1996		SHEET:	

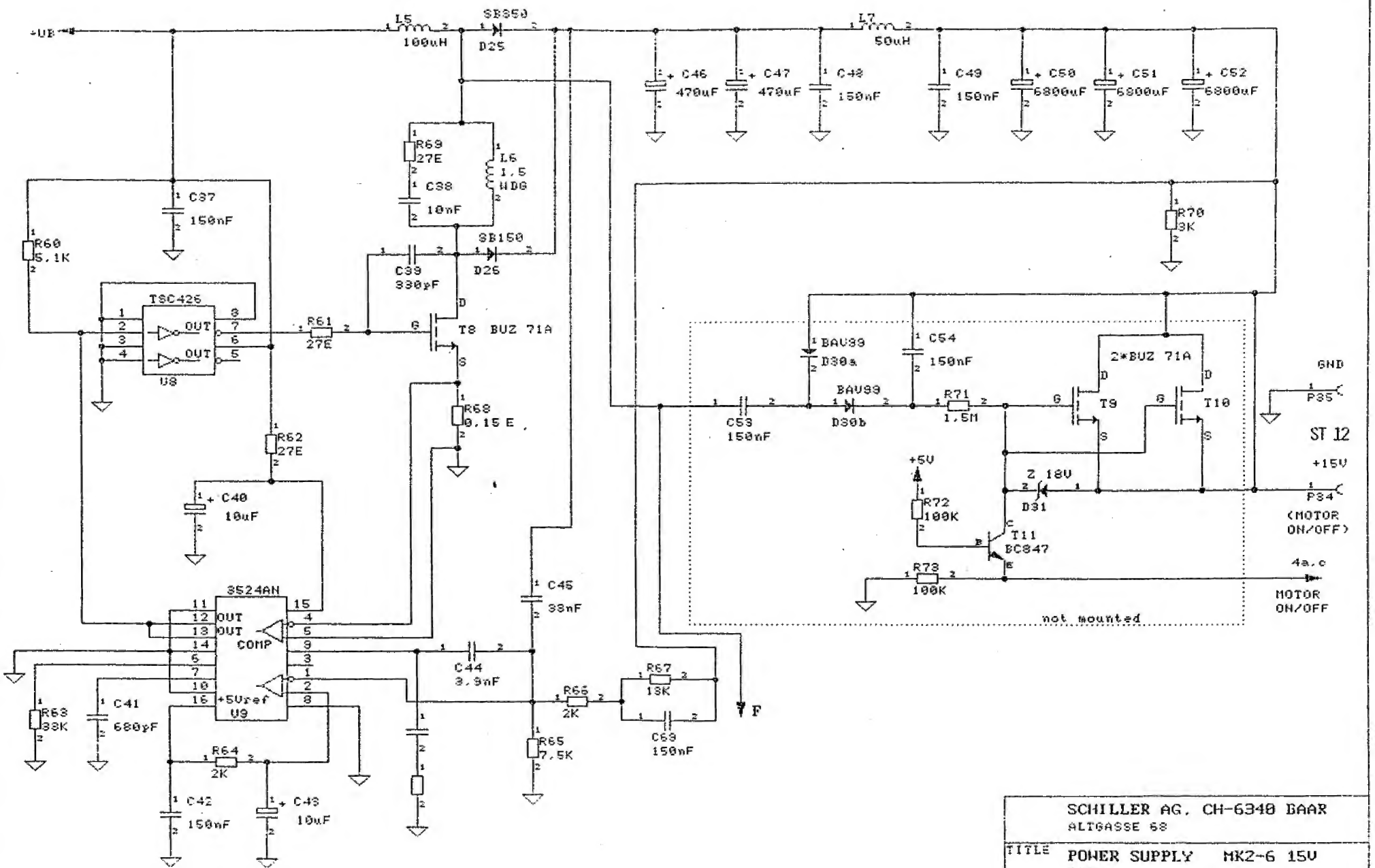


SCHILLER AG, CH-6340 BAAR ALTGASSE 68			
TITLE POWER SUPPLY MK2-6(A) OF			
SIZE B	CODE	NUMBER 1100601 OF	REV A
DATE 21.MAI 1986		SHEET	

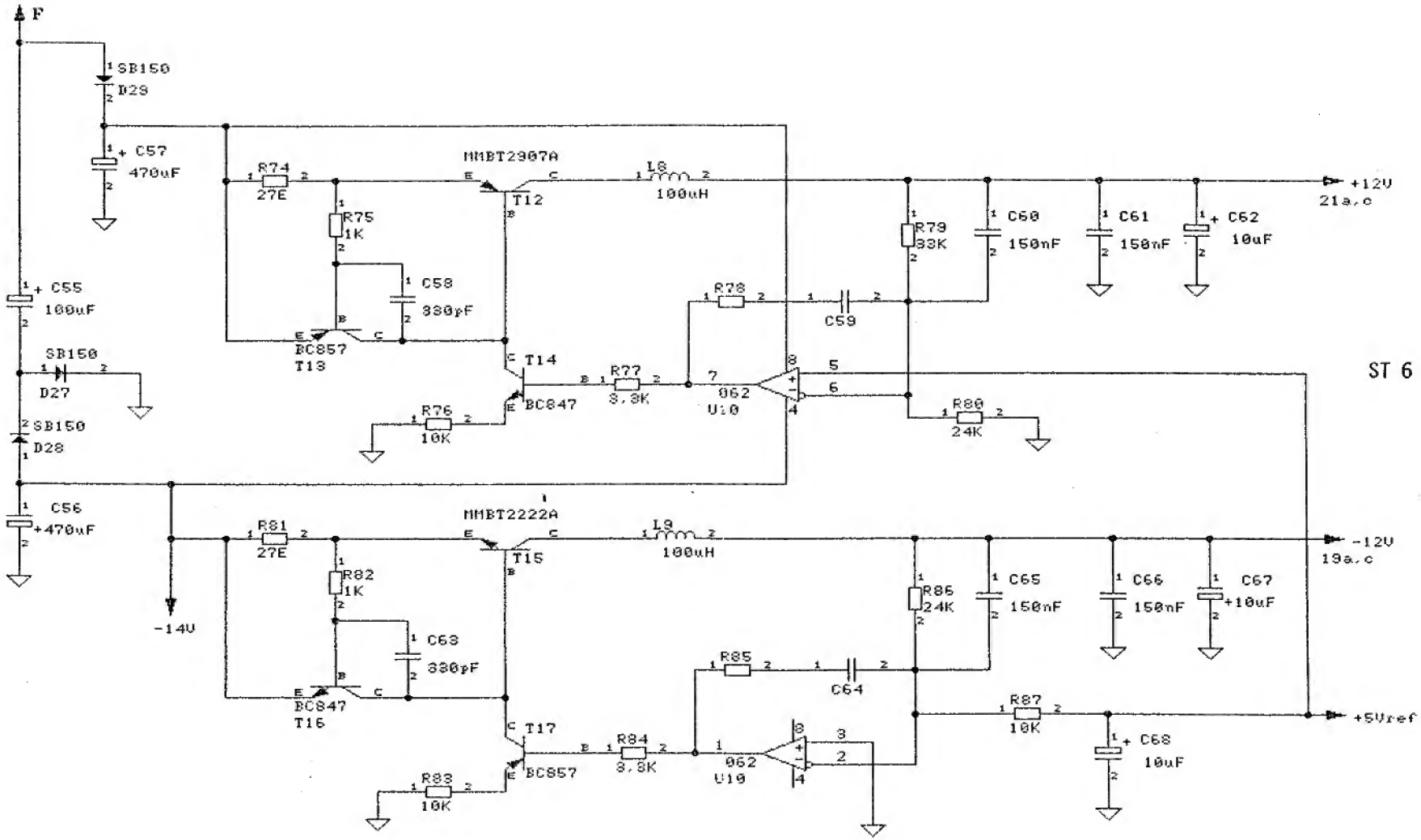


SCHILLER AG, CH-6340 BAAR ALTGASSE 68			
TITLE POWER SUPPLY MK2-6(A) BC			
SIZE B	CODE	NUMBER 1100601 BC	REV A
DATE 21.MAI 1986		SHEET	

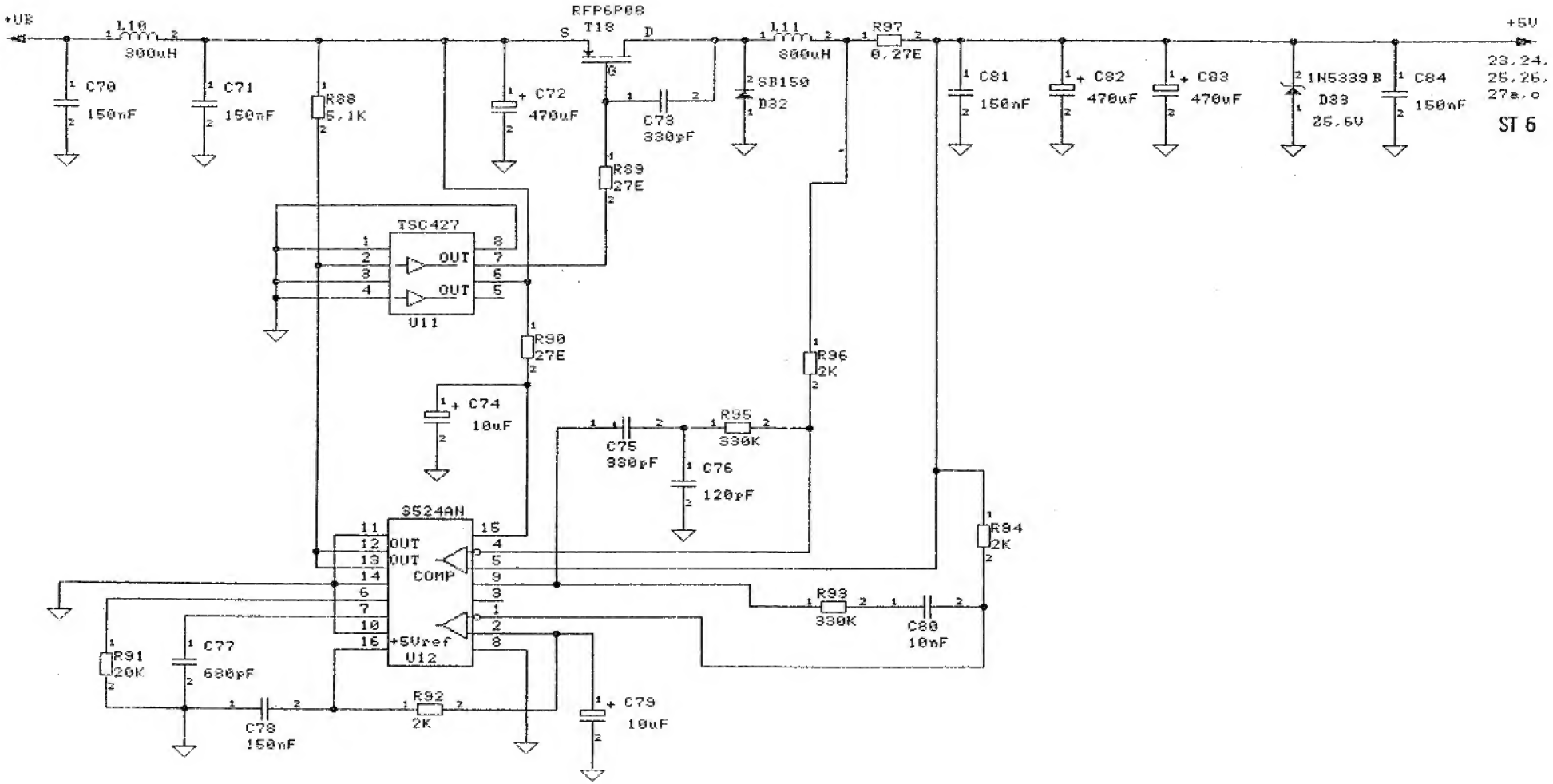

U input 18 - 30V
Si2
F1.25A
L1
300uH
FERRIT
PERLE
T1
P6P03
C1
2200uF
C2
150nF
C3
150nF
C4
100uF
C5
150nF
D2
SB150
L2
1.5MD6
C7
10nF
R18
27E
D3
SB350
L3
500uH
R19
9.12E
C8
150nF
C9
470uF
D4
1N5400
C10
470uF
R24
3K
C
BAV99
D1a
BAV99
D1b
TSC427
U11
R38
27E
LL4148
D86
R17
220E
R16
27E
79L15
U1
C22
10uF
C18
10uF
C19
150nF
R15
2K
R3
5.1K
R4
100K
C21
150nF
3524AH
U9
+5Vref
COMP
R14
100K
C13
330pF
C12
120pF
C11
150nF
R13
1.5M
R5
33K
C17
680pF
R7
75K
C14
2.2nF
R11
1.5K
LL4148
D6
R6
2K
R10
2.2K
R12
7.5K
062
U4
C16
150nF
C15
10uF
R8
4.7K
R9
500E
T2
TIC116
R23
1K
062
U4
R22
10K
R20
11K
LL4148
D7
D8
LM336
Z5.0V
R21
5.1K
SCHILLER AG, CH-6348 BAAR
ALTGASSE 68
TITLE
POWER SUPPLY HX2-6 (A) NR
13.8V BATT. CHARGER
SIZE
B
CODE
NUMBER
1100601 NR
REV
A
DATE 21.MAI 1986
SHEET



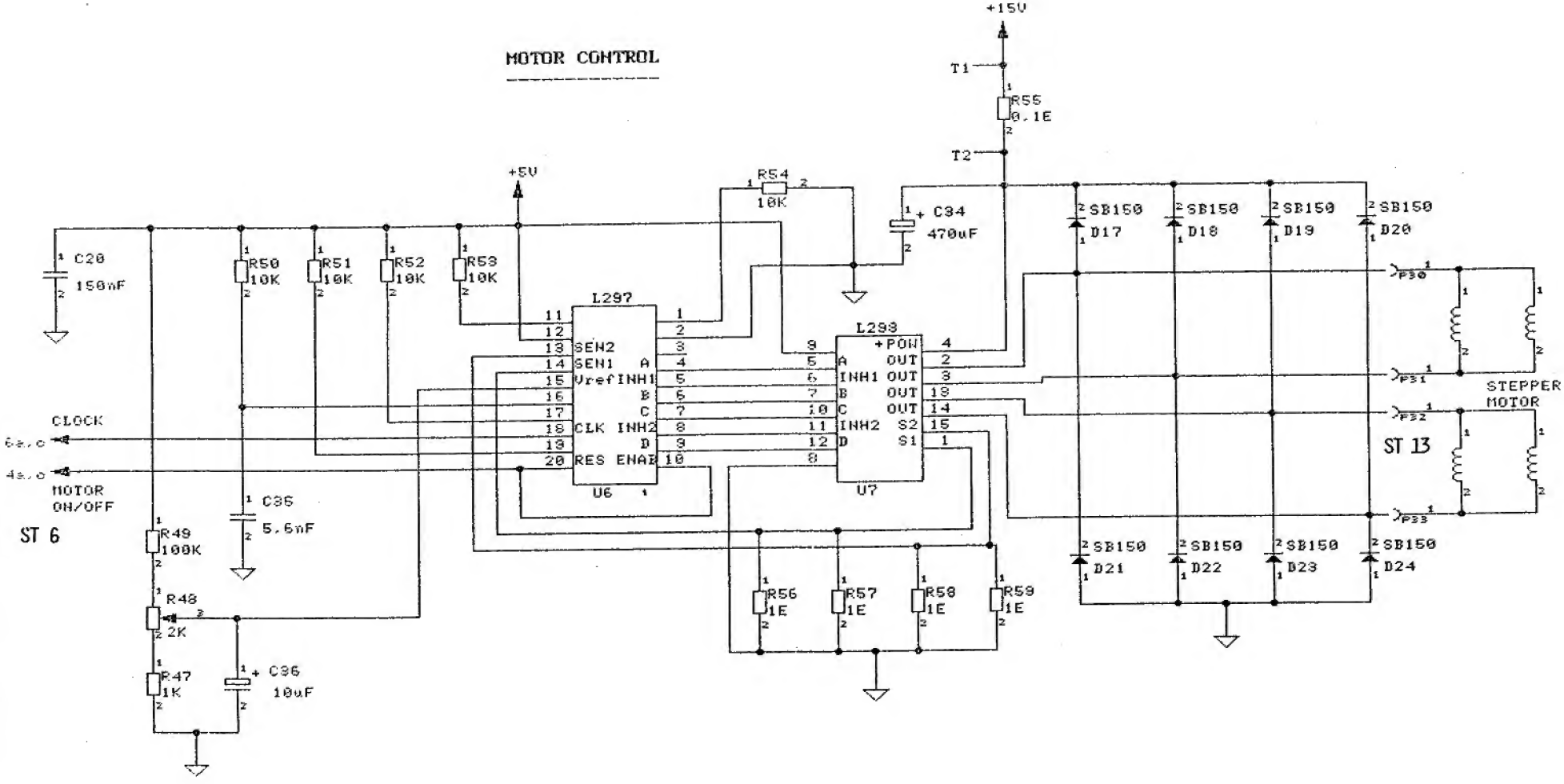
SCHILLER AG, CH-6340 BAAR ALTGASSE 68			
TITLE: POWER SUPPLY MK2-6 15V 15V			
SIZE: B	CODE:	NUMBER: 1100601 15V	REV: A
DATE: 21.MAI 1986		SHEET:	



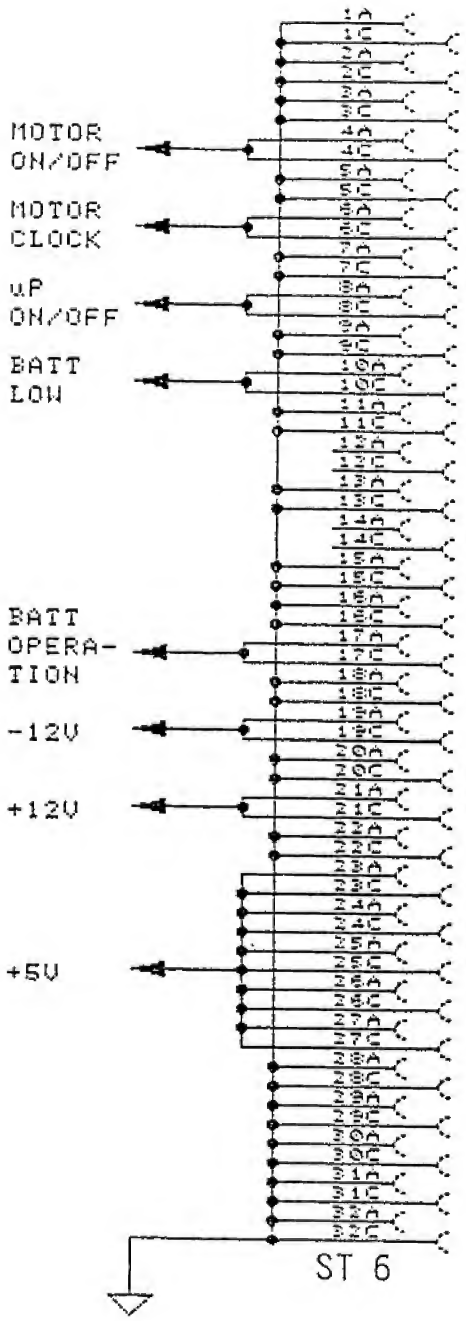
SCHILLER AG, CH-6340 BAAR ALTGASSE 68			
TITLE: POWER SUPPLY MK2-6(A) 12V +/-12V			
SIZE: B	CODE:	NUMBER: 1100601 12V	REV: A
DATE: 21.MAI 1986		SHEET	



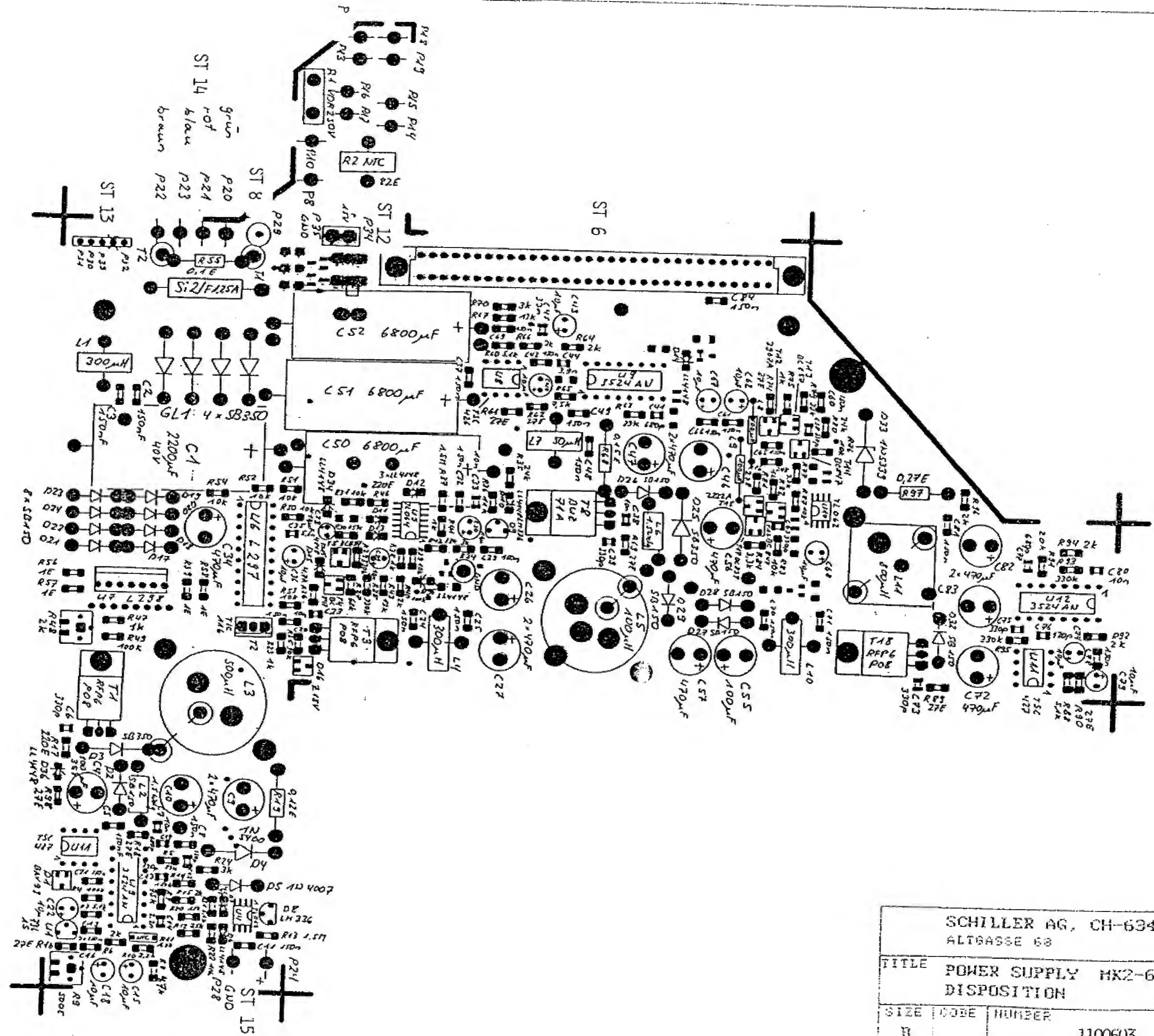
SCHILLER AG, CH-6340 BAAR ALTGASSE 68			
TITLE: POWER SUPPLY MK2-6(A) 5V 5V			
SIZE: B	CODE:	NUMBER: 1100501 5V	REV: A
DATE: 21 MAI 1996		SHEET	



SCHILLER AG, CH-6340 BAAR ALTGASSE 68			
TITLE: MOTOR CONTROL MK2-6(A) MC			
SIZE: B	CODE:	NUMBER: 1100601 MC	REV: A
DATE: 9.Mai 1996	SHEET:		



SCHILLER AG, CH-6340 BAAR ALTGASSE 68			
TITLE: POWER SUPPLY MK2-6 PIN PINOUT ST 6			
SIZE B	CODE	NUMBER 1100601 PIN	REV A



SCHILLER AG, CH-6340 BAAR
ALTGASSE 68

TITLE	POWER SUPPLY HK2-6(A) DISPOSITION
SIZE	B
CODE	
NUMBER	1100603
REV	A
DATE	25 SEPT. 1986
SHEET	

CIRCUIT THEORY

AT-6 Power Supply and Charger Circuitry

- Main input and unregulated DC output
- Charging principle, PWM (pulse width modulation) circuit.
- Overvoltage protection of the battery charging circuit output (point B on the schematic power supply MK2-6 '13.8V Batt. charger)
- Operation detection modes, battery or main (point C on the schematic power supply MK2-6 '13.8V Batt. charger)

1. AT-6 Mains Input Circuit

The mains supply is first connected to a line filter module including two main fuses each rated at 200 mA (S.B.). The 110 Vac version is equipped with another main line filter which is adapted for 110 Vac use (110 Vac filter P/N: 4.270002), the fuses being rated at 400 ma (S.B) each. The mains is connected to the mains transformer over a dual-pole mains switch including a monitoring lamp (190..240Vac = green pushbutton, 110Vac = red coloured switch button P/N 4.220010 + 4.220050 for the cover). Mains connection is indicated via the integrated mains switch bulb LP1 which also proves that the two main fuses are not blown. Overvoltage protection is provided by a VDR (variable differential resistor), which suppresses possible mains spikes in order to protect the mains transformer. The mains transformer can be adapted for both mains selections by means of connecting the primary windings in series for 190..240Vac and in parallel for the 110Vac mode.

The mains transformer secondary coils (parallel connected) generate an AC output varying between 20 and 25Vac between St-4 connector pins P20 and P23 (see power supply schematic 190-240Vac/50 Hz). The unregulated output voltage (point A) is connected to a full-wave bridge rectifier (4 schottky diodes, SB 350) which generates an unregulated DC output corresponding to around 25 Vdc (± 20 %). The DC current consumption over the secondary 'fuse Si2 (1.25 Adc) may change between 100 mA and 700 mA, depending on the charging state of the battery. The standby DC current surge over Si2 will generally be around 170 mA (± 20 %) **If no battery is connected** to the power supply and the AT-6 stays in standby mode (no printing process). A 70 % discharged battery will cause a current increase across Si2 up to **1.1 Adc**. Once the battery has reached the final charging phase (around 90 % of charge), the current will decrease to the nominal standby current of ≈**170 mA**. See point 5 for more details about calibration of the battery charge circuit.

2. AT-6 Battery Charger Circuit Description

The detection of the presence of the mains supply is provided by sensing the charging voltage which corresponds to ≈14.5 Vdc (at 20°C) at the D4 anode side when the mains supply is ON, thus 0V when the mains is switched OFF (the battery voltage can be measured at the cathode of D4). The charging voltage is controlled by a PWM circuit (U9, 3524). The PWM circuit pumps energy (current) over the series inductance L1 (300 µH) by switching the FET (T1) **ON**, thus providing the characteristic function d_I / d_T. When the FET is off, the function d_U / d_T occurs (voltage build-up). The purpose of the PWM circuit is to keep a constant regulated voltage (without being affected by temperature or load changes) by adapting the duty-cycle ratio of the ON/OFF phase which drives the power MOSFET TI.

The duty-cycle ratio, which influences the output voltage, is controlled by the PWM circuit by means of sensing the output regulator voltage output (point B on power supply circuit, right after rectifier diode D4). The PWM differential error amplifier compares the inverting input of the voltage input sense (Pin #1) with the internal 5V reference of the 3524. If for any reason the charging output voltage increases to 15.8 V, the output of the voltage divider network (R12, R10/R11, R8, R9) connected after the non-inverting voltage follower (U4) corresponds therefore to 5Vdc, thus switching the PWM output OFF (differential input = 0). Current limiting protection is performed over the current sense resistor R19 (0.12Ω) connected to the current sense amplifier input of the 3524 regulator.

The current limit threshold at the input of the 3524 current sense comparator monitors the voltage drop across the 0.12Ω sense resistor, the activation threshold is circuit defined to be active (regulator shut-off) by the condition U.sense = ≥ than 200mV. Thus when the power supply provides a maximum available current of 1.6 A, voltage drop of 200 mV across R19 (0.12Ω) would therefore correspond to I= U/R = 1.667 Adc.

NOTE: The lead-acid battery is automatically charged, even if the AT-6 has been switched off (keyboard ON/OFF fnc). Unless the main switch (green front switch) has been switched off, the charging circuit is inoperate.

3. Charging Circuit Overvoltage Protection

In order to protect the battery from an excessive charging voltage (lead-acid batteries are very sensitive to overvoltage), the circuit also consists of a power input crowbar which short-circuits the DC input (18..30 Vdc) thus tripping Si2 (1.25 A). The circuit works by means of sensing the output charging voltage at the output of diode D4 (cathode, see schematic point B). OpAmp U4b is connected as a voltage follower (impedance converter) and feeds the "sensed" voltage back to the input of OpAmp U4a (comparator) via voltage divider network (R20 & R21). The comparator reference corresponds to 5 Vdc and is generated by the LM 336 bandgap reference circuit Z5.0V. As soon as the charging voltage exceeds ≥15.8 Vdc, the potential at the comparator non-inverting input (pin 3) will correspond to 5Vdc thus causing the comparator output to saturate the gate of crowbar SCR T2 (thyristor TIC 116, point B on the schematic power supply MK2-6 ´13.8V Batt charger). As a result of firing the SCR, the DC unregulated output will instantly short to ground thus blowing Si2 fuse.

4. Temperature Compensation

The charging circuit is also temperature compensated by means of an NTC thermistor resistance (R11) connected to the voltage feedback path, if the ambient t° increases, the NTC resistance decreases thus affecting the divider network and reducing the output voltage charge.

NOTE: The NTC (negative temperature coefficient) resistance value is given by 1.5 kΩ at room temperature (20°C).

5. Battery Charge Calibration

Lead-acid batteries are high quality, maintenance-free accumulators and have a long operational life in standby or cyclic applications. Lead-acid batteries are charged by a constant VOLTAGE, unlike NiCd cells which are charged by a constant current regardless of the voltage. The manufacturer of these batteries specifies that the EMF charge to the element is defined as 13.6 Vdc at 23°C (see the table 'U = f(t°)'. The calibration of the correct charging voltage requires great care and should not be considered as a 5 minute job (see service manual procedure), otherwise the life-time of the accumulator will be greatly reduced. The fundamental conditions for a successful calibration are:

1. Record the ambient temperature with a digital temperature instrument by placing the sensor in the case of the AT-6 (in the vicinity of the NTC thermistor). The reading should be stable and within 0.5° of max. tolerance.

   CAUTION: make sure that the temperature probe does not touch any components or heat sink of power devices, otherwise the probe or the circuit may be destroyed.

2. The calibration of the specific charge voltage (according to the tables) has to be done with the battery connected to the machine, the battery acts as a current regulator (variable load) !

3. You **must** be sure that the calibration is carried out with a **fully charged** battery, otherwise the charging voltage will be false by the lower chemical inner resistance of the lead-acid element!

4. Once calibrated, the charging voltage has to be monitored for a period of at least 12 hours (always in the fully charged state).

NOTE: The lead-acid battery is a long-life, maintenance-free accumulator which has a nominal voltage of 12 Vdc and a current capacity of 2 Ah (2 ampere/hour).

6. Battery/Mains Operation Mode Detection (schematics 13.8V Batt. charger & power supply)

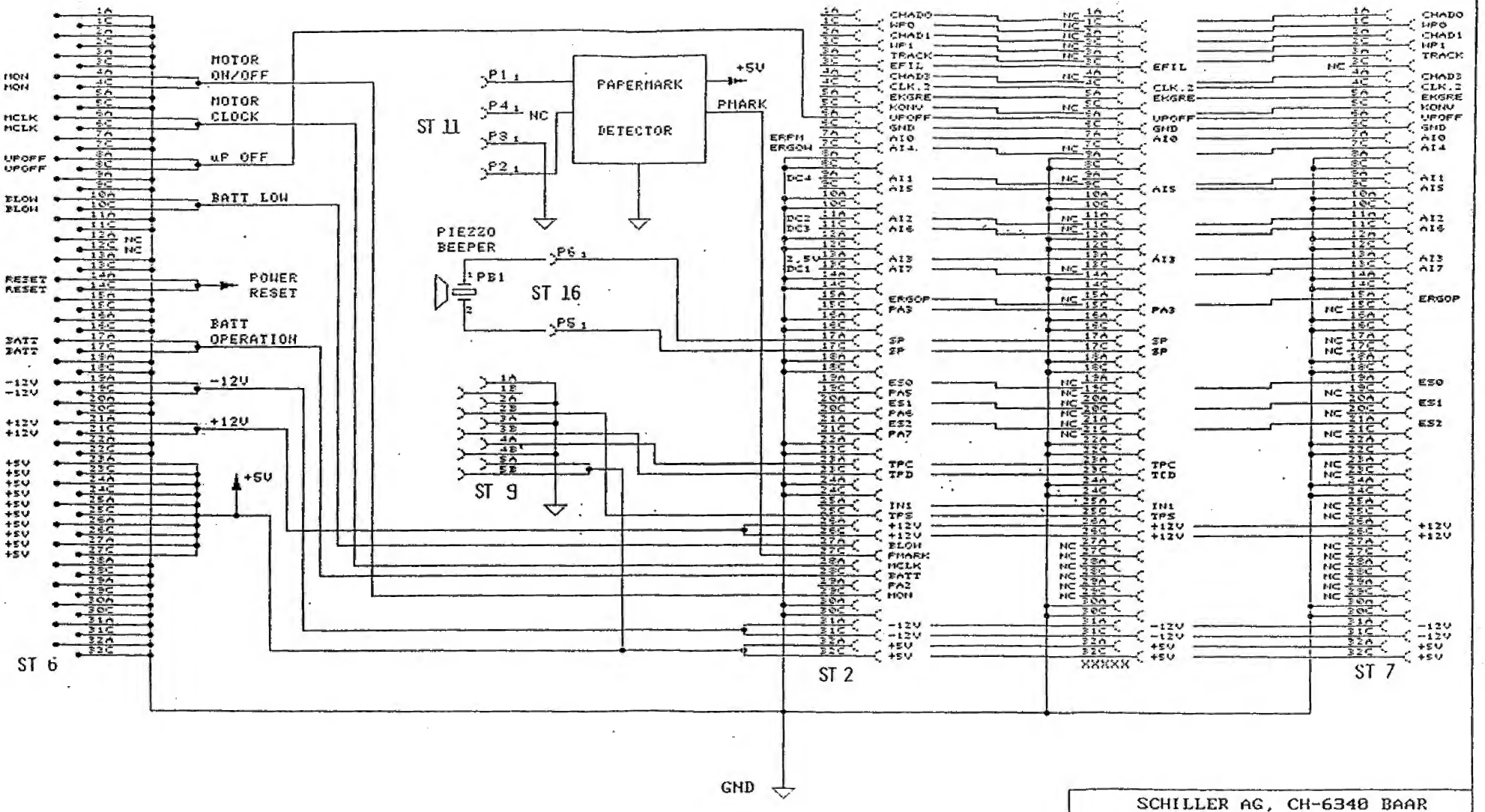
The battery/mains detection is purely based on 1 diode and 1 data selector/MUX IC on the µPcb. The Anode of diode D4 is "LOW" once the AT-6 works on the battery (no mains). When the mains is ON, the battery is charged over point "B" by a voltage corresponding to ≈13.8 Vdc, the **Anode of D4** is now connected to around 14.8 ..15 Vdc. The path of the MAINS "ON" detection started at point "C" where ≈14.8 Vdc is connected to D14 cathode (LL4148), this point is called "BATT OPERATION ON/OFF". The Anode of D14 is directly connected to the µProcessor Pcb over the backplane main connector ST6 17a, c to µPcb Europe type connector **ST-2 pin 28c**. The signal "BAT" provided on the µPcb by D14, is then connected to pin # 10 of a quad 2 input data selector/MUX (three state outputs). Pin # 10 of the HC257 MUX is connected to a 10kΩ pull-up resistor connected to Vdd (+5Vdc), therefore when the mains in **ON**, D4 Cathode has about 14.8..15 Vdc thus will not conduct and the Data line input # 10 (on the schematic defined as **Input 3B**) will be tied up to +5Vdc over the Pull-up resistor. On the other hand if the mains is OFF, the diode will conduct to GND and pin # 10 of the HC257 MUX will change to LOW (≈1.5Vdc). The change of status of the MUX input # 10 is then interpreted as a 4 Bit nibble (D8..D11) transferred to the data bus therefore indicating the status of the battery mode.

NOTE: With a standard measuring tool like an oscilloscope, you may not clearly identify the nibble status change on the Data bus when toggling between the modes. A logic analyzer would be a better adapted tool for that kind of digital analysis. This is why it would be preferable to limit the check to the input of the MUX gate (pin #10).

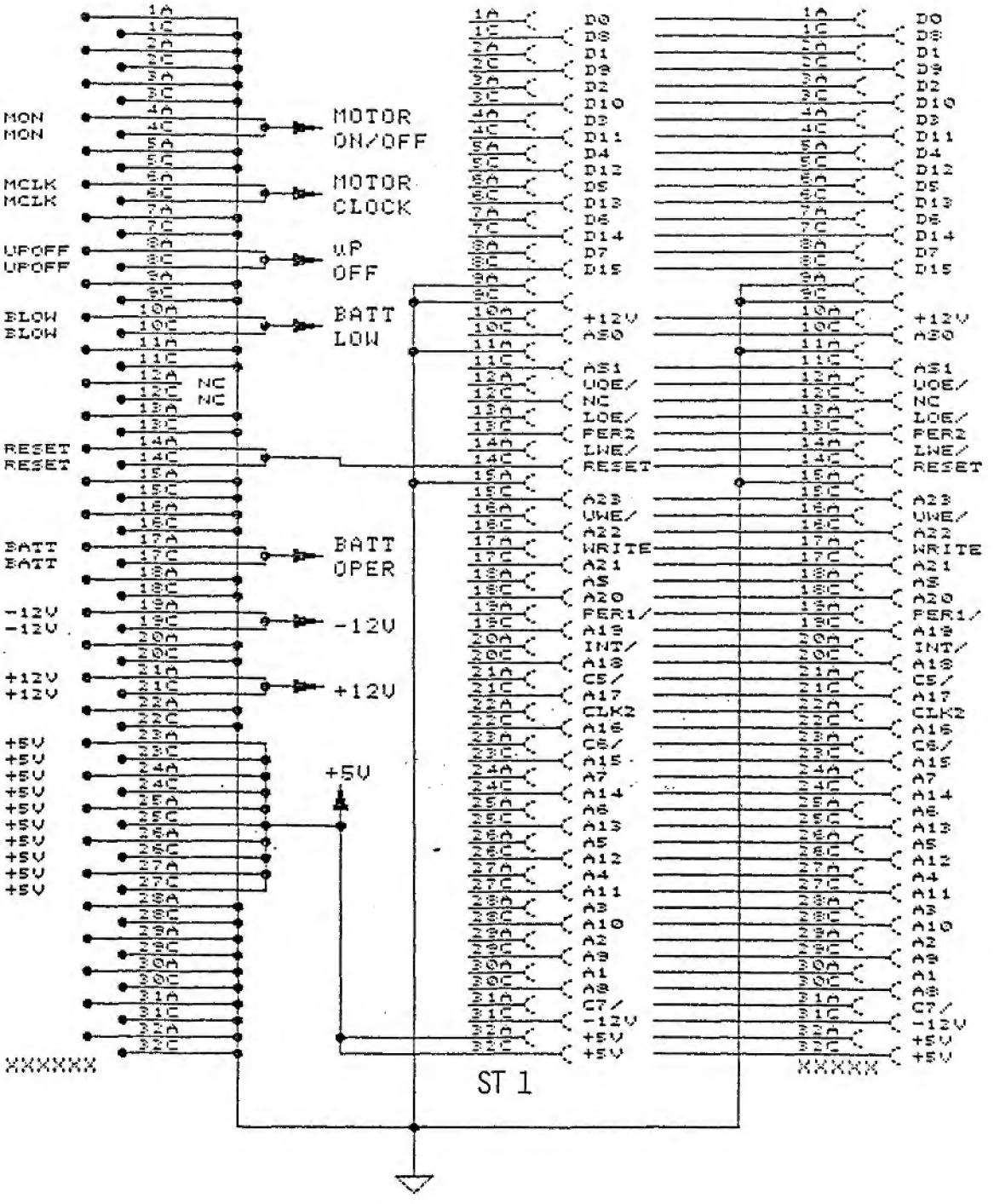
SECTION 6

BACKPLANE PCBs
INTERCONNECTION DIAGRAM
MK2-4

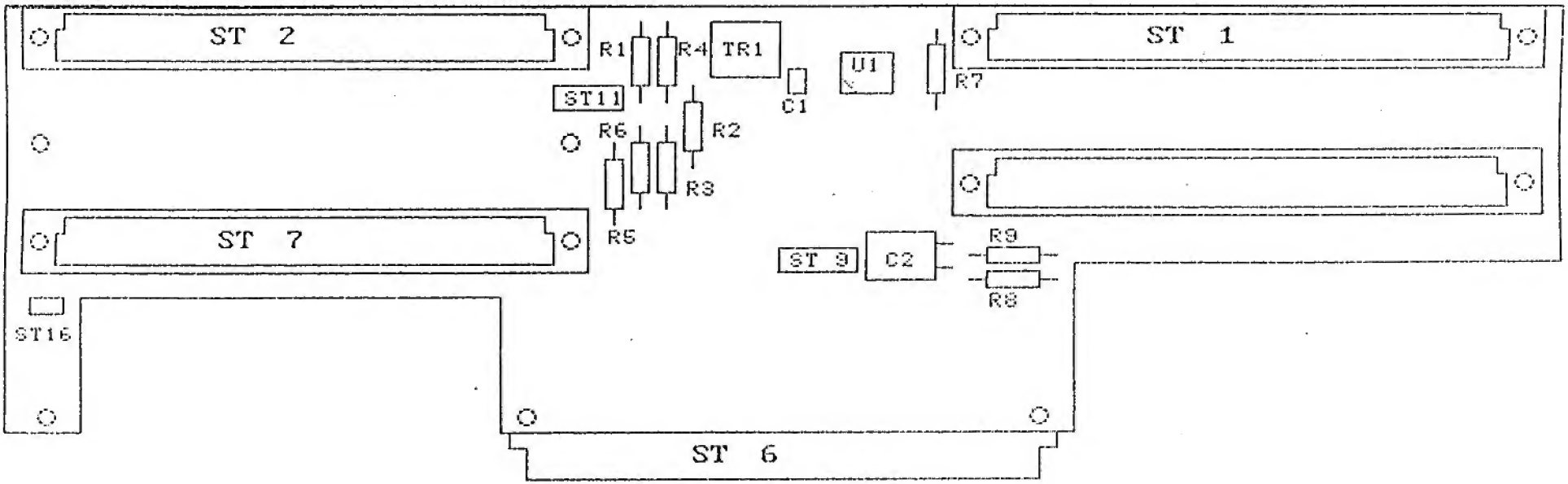
	Drawing No.
Backplane	1100401 C1
Backplane Signals Despatch	1100401 C2
PCB Layout	1100403



SCHILLER AG, CH-6340 BAAR ALTGASSE 68			
TITLE	BACKPLANE MK2-4		
SIZE B	CODE	NUMBER 1100401 C1	REV A
DATE 22.MAI 1986		SHEET	



SCHILLER AG, CH-6340 BAAR ALTGASSE 68			
TITLE BACKPLANE MK2-4 DB			
SIZE B	CODE	NUMBER 1100401 C2	REV A
DATE 22.MAI 1986		SHEET	

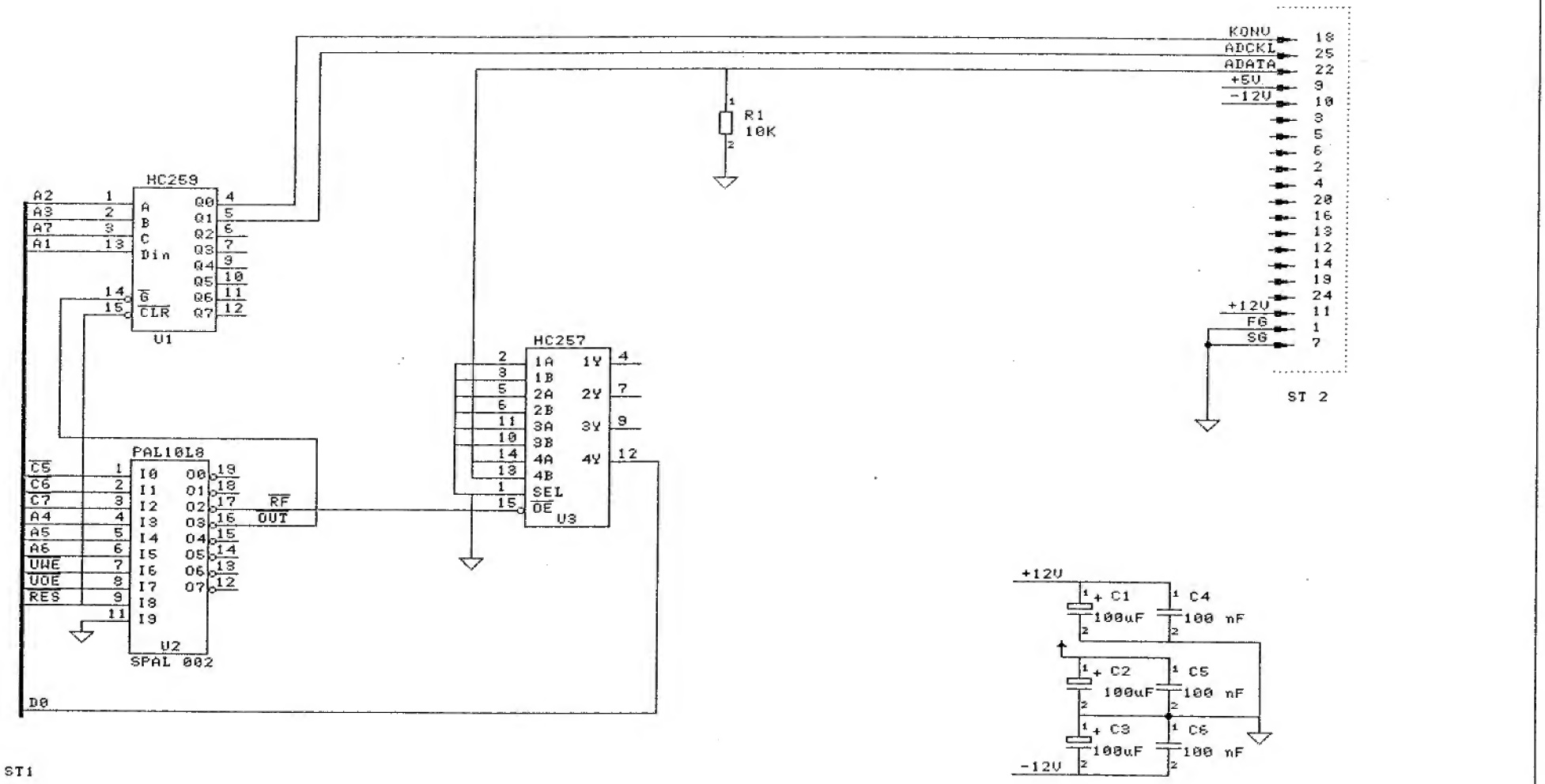


SCHILLER AG, CH-6340 BAAR ALTGASSE 68			
TITLE DISPOSITION MK2-4			
SIZE B	CODE	NUMBER 1100403	REV A
DATE 9. OKT. 1986		SHEET	

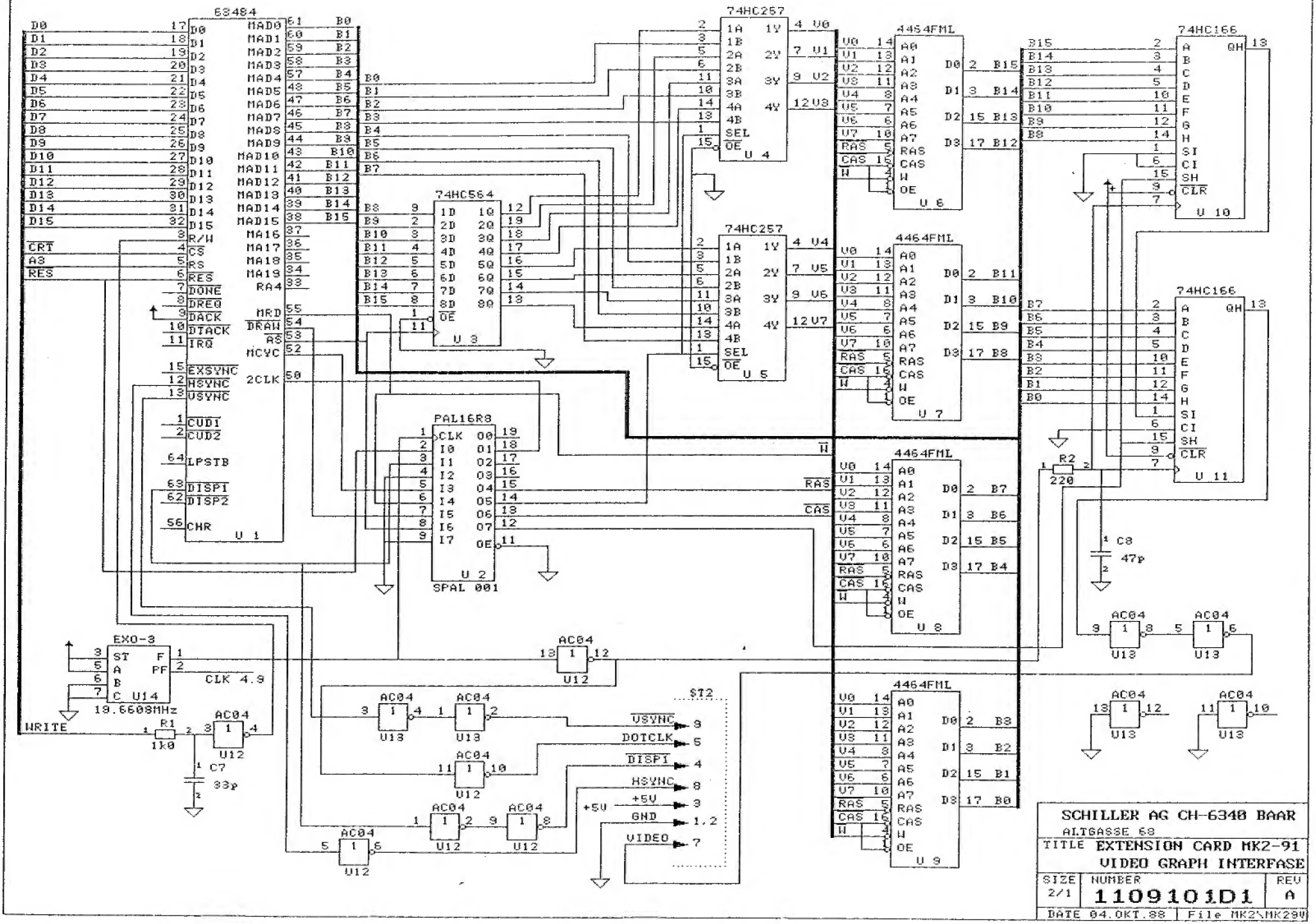
SECTION 7

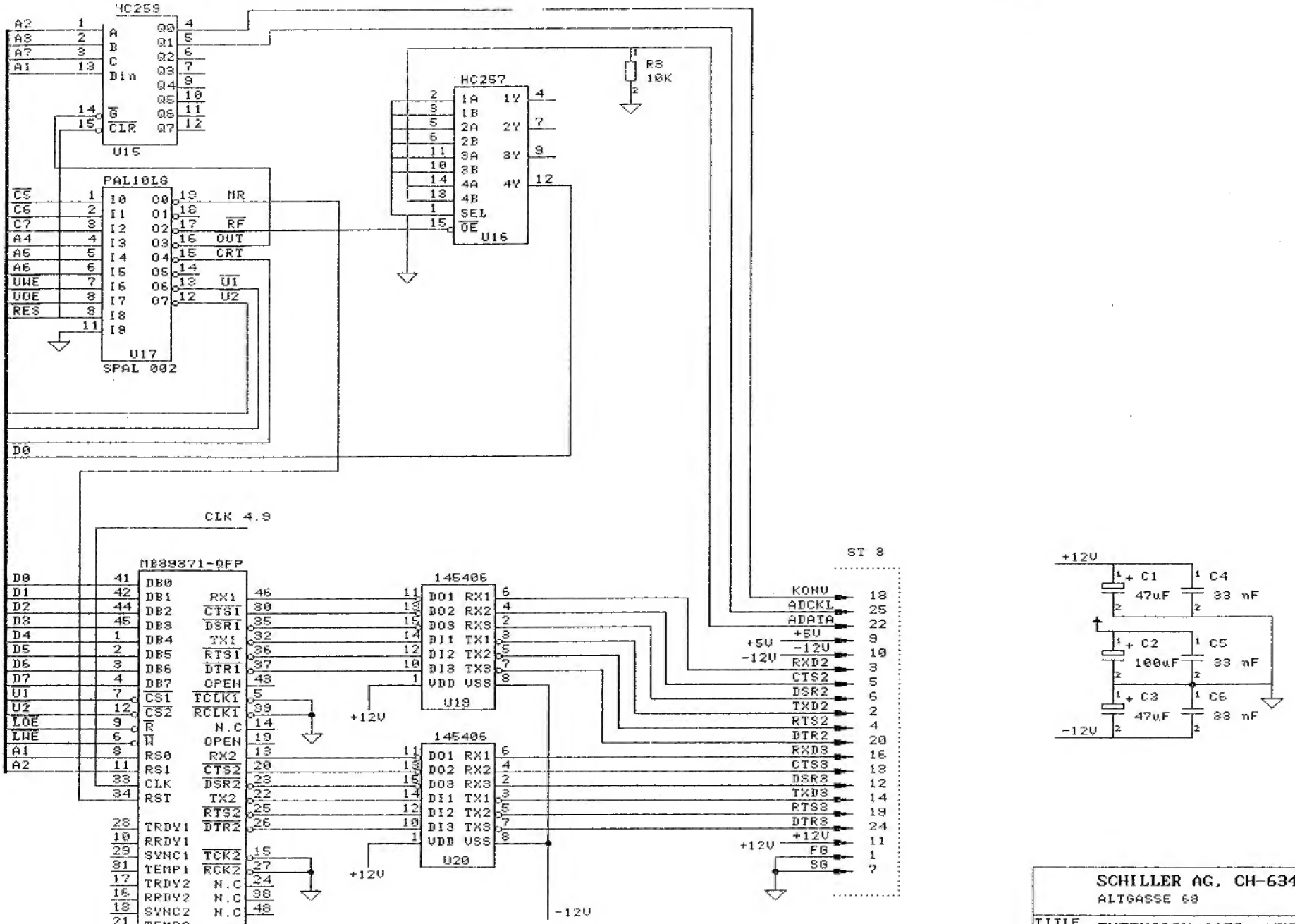
RS-232 / VIDEO / SPIRO

	Drawing No.
Spiro Interface	1109201 D1
Video Graphics Interface	1109101 D1
RS-232 / Spiro Interface	1109101 D2
Spiro Disposition MK2-92	1109203 D1
Spiro / RS-232 / Video Disposition MK2-91	1109103 D1



SCHILLER AG, CH-6340 BAAR ALTGASSE 68			
TITLE	EXTENSION CARD MK2-92 SPIRO (STAND ALONE)		
SIZE 1/1	CODE	NUMBER 1109201D1	REV A
DATE 28. NOVEMBER 88	File:MK2\MK292		


68484
74HC257
74HC564
4464FML
74HC166
PAL16R8
SPAL 001
EXO-3
19.6608MHz
AC04
SCHILLER AG CH-6340 BAAR
ALTGASSE 68
TITLE EXTENSION CARD MK2-91
VIDEO GRAPH INTERFASE
SIZE 2/1
NUMBER 1109101D1
REV A
DATE 04.OKT.88
File MK2\MK290



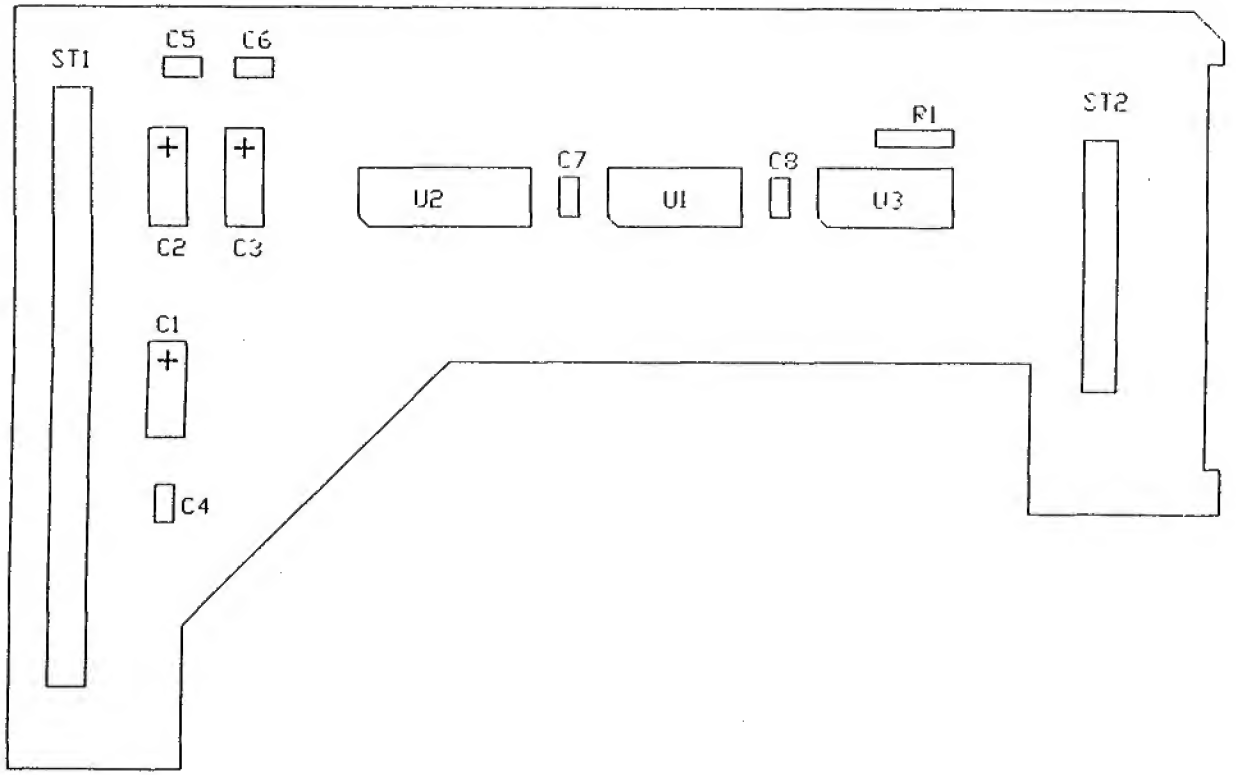
SCHILLER AG, CH-6340 BAAR
ALTGASSE 68

TITLE: EXTENSION CARD MK2-91
RS232 / SPYRO

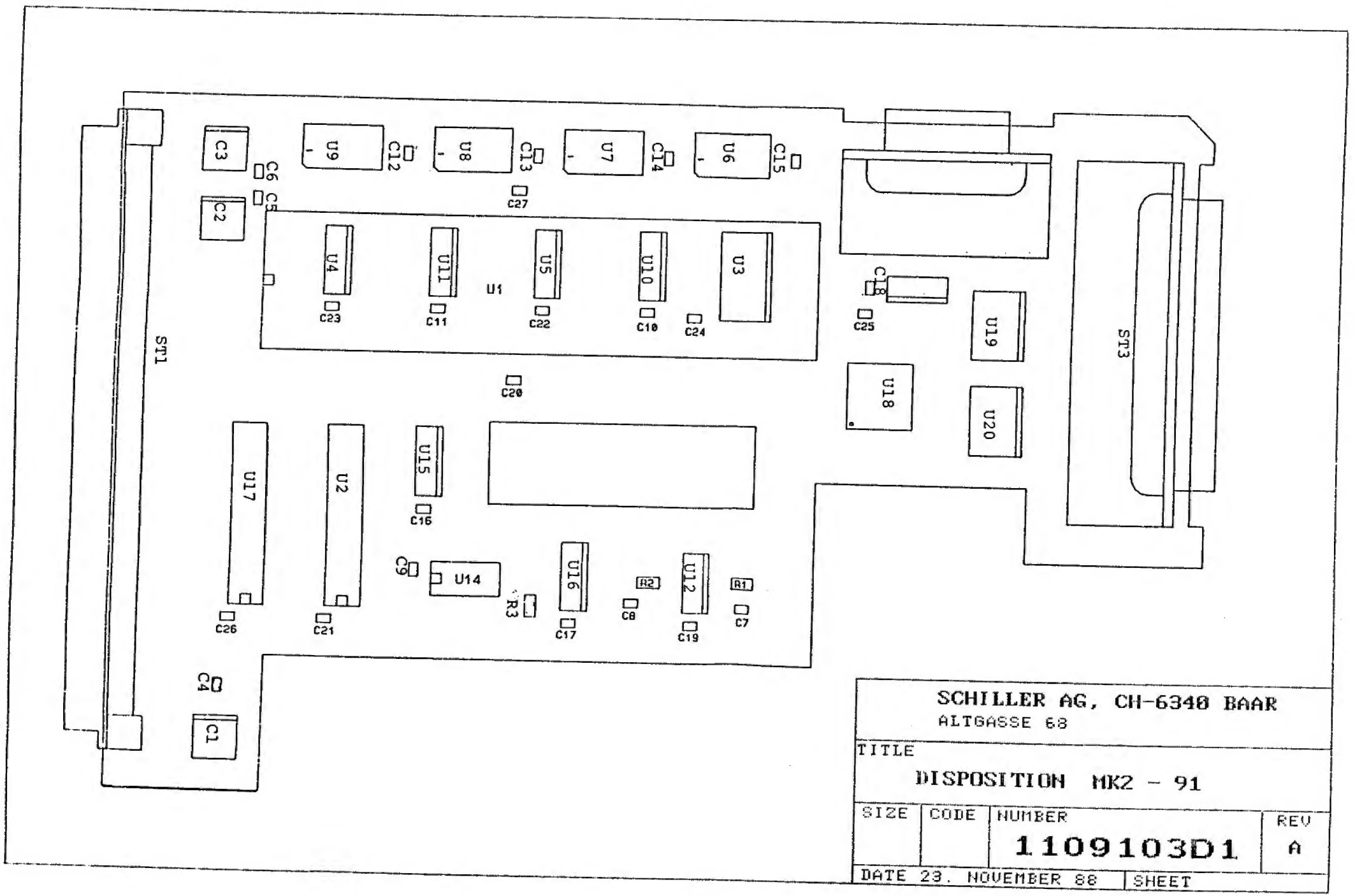
SIZE	CODE	NUMBER	REV
2/2		1109101D2	A

DATE 04. OKTOBER 88 | File:MK2\MK29R

BESTUECKUNG MK 2-92 (BESTUECKUNGSSEITE)



SCHILLER AG, CH-6340 BAAR ALTGASSE 68			
TITLE DISPOSITION MK2 - 92			
SIZE	CODE	NUMBER 1109203D1	REV A
DATE 23. NOVEMBER 88		SHEET	



SCHILLER AG, CH-6340 BAAR
ALTGASSE 68

TITLE
DISPOSITION MK2 - 91

SIZE	CODE	NUMBER	REV
		1109103D1	A

DATE 23. NOVEMBER 88 | SHEET

SECTION 8

SERVICE INFORMATION

CARDIOVIT AT-6

Service Information

1. EQUIPMENT NEEDED

Oscilloscope
Analog Meter
3 pieces of wire (approx. 6")
1 short (low capacitance) tweaker
1 low capacitance screwdriver
soldering iron
1 small Phillips screwdriver
1 small standard screwdriver

2. OPENING UP THE UNIT

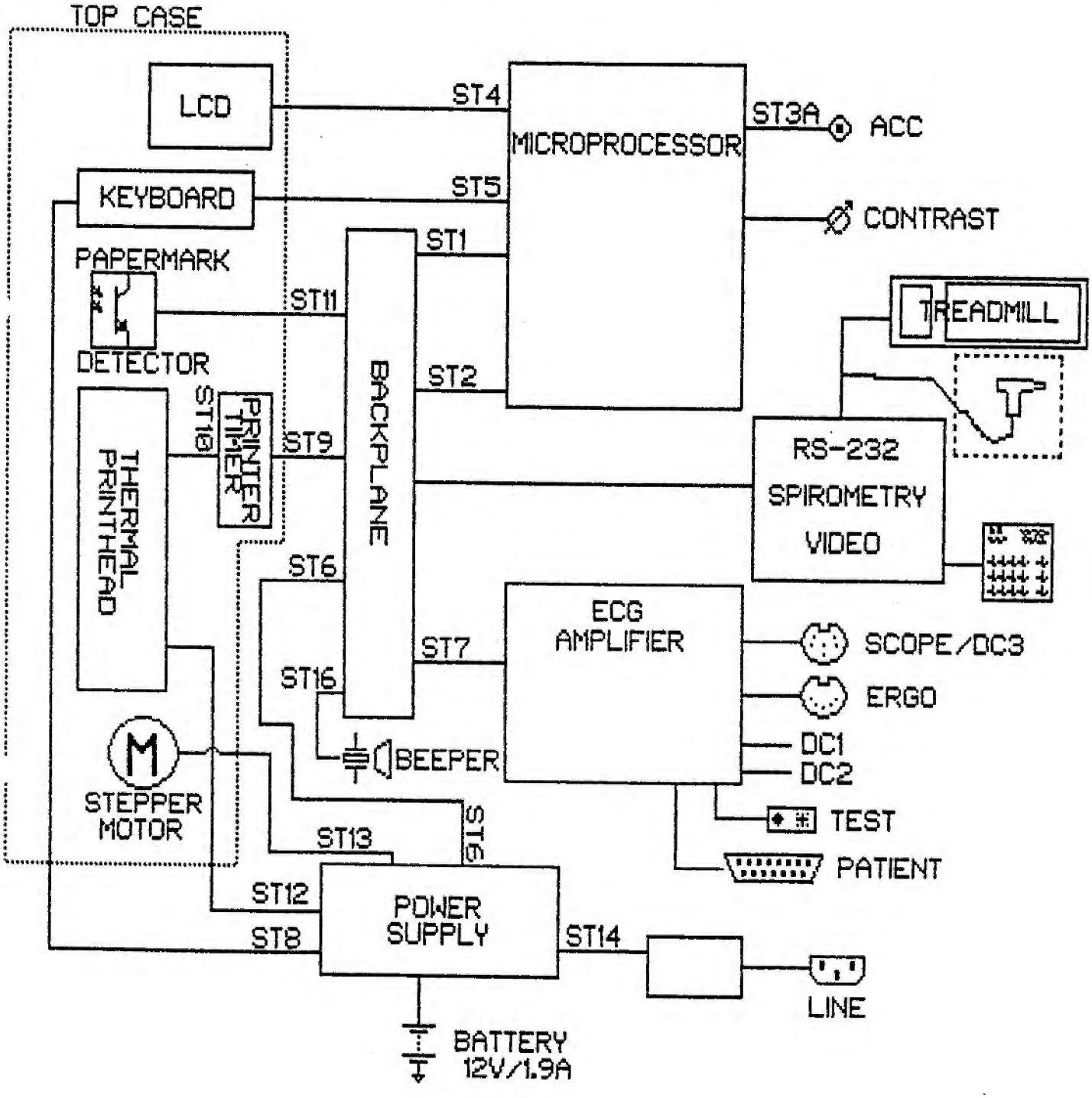
1. Pull out and remove the white contrast control knob from the right-hand side of the unit.

2. Turn the unit over and remove the four Phillips screws in each corner of the unit. You will also need to remove the two standard screws located in the centre, along the side, if they are present.

3. Using both hands, hold the top and bottom cases together and turn the unit upright. BE CAREFUL !

4. Gently lift up on the front side of the top cover removing the cable connections as they appear. Refer to Figure 1 for connector locations. This will expose the inside of the unit.

AT-6 BLOCK


TOP CASE
LCD
ST4
MICROPROCESSOR
ST3A
ACC
KEYBOARD
ST5
CONTRAST
PAPERMARK
ST1
TREADMILL
ST11
DETECTOR
BACKPLANE
ST2
THERMAL PRINTHEAD
ST10
PRINTER TIMER
ST9
RS-232
SPIROMETRY
VIDEO
ST6
ECG AMPLIFIER
ST7
SCOPE/DC3
ST16
ERGO
BEEPER
DC1
DC2
STEPPER MOTOR
ST15
TEST
ST13
PATIENT
ST12
POWER SUPPLY
ST14
ST8
LINE
BATTERY 12V/1.9A

3. MICROPROCESSOR

With the exception of battery replacement and clock adjustment, the microprocessor must only be serviced by the manufacturer. The entire board is therefore replaced in the field.

3.1 Board Replacement

Board replacement is fairly straight forward. Remove the two Phillips screws that hold the microprocessor down. Refer to Figure 1 for location. Pick up on the outer edge of the board and gently pull it away from the interconnect board.

3.2 Battery Replacement

The battery backup for the real time clock circuit is powered by a 3.5V Lithium battery. If the battery voltage goes below 2.0V, battery replacement is required. To replace the battery, first remove the microprocessor board. Turn the board over, desolder the old battery and insert the new battery. Readjust clock frequency for the new battery.

3.3 Adjusting Clock Frequency

The clock frequency is adjusted by variable capacitor CT1. Refer to Figure 1 for location. With your oscilloscope attached to pin 15 of U3 (see Figure 1 for location) adjust CT1 with a low capacitance tweaker for a 4ms duty cycle.

NOTE: If there is no square wave at pin 15 of U3, enter the day of the week one time via the keyboard.

3. µCOMPUTER BOARD

Mit Ausnahme vom Ersetzen der Batterie und dem Richten der Uhr wird dieses Board ausschliesslich vom Hersteller bearbeitet. In den Servicestellen wird deshalb bei anderen Defekten gleich das ganze Board ersetzt.

3.1 Board ersetzen

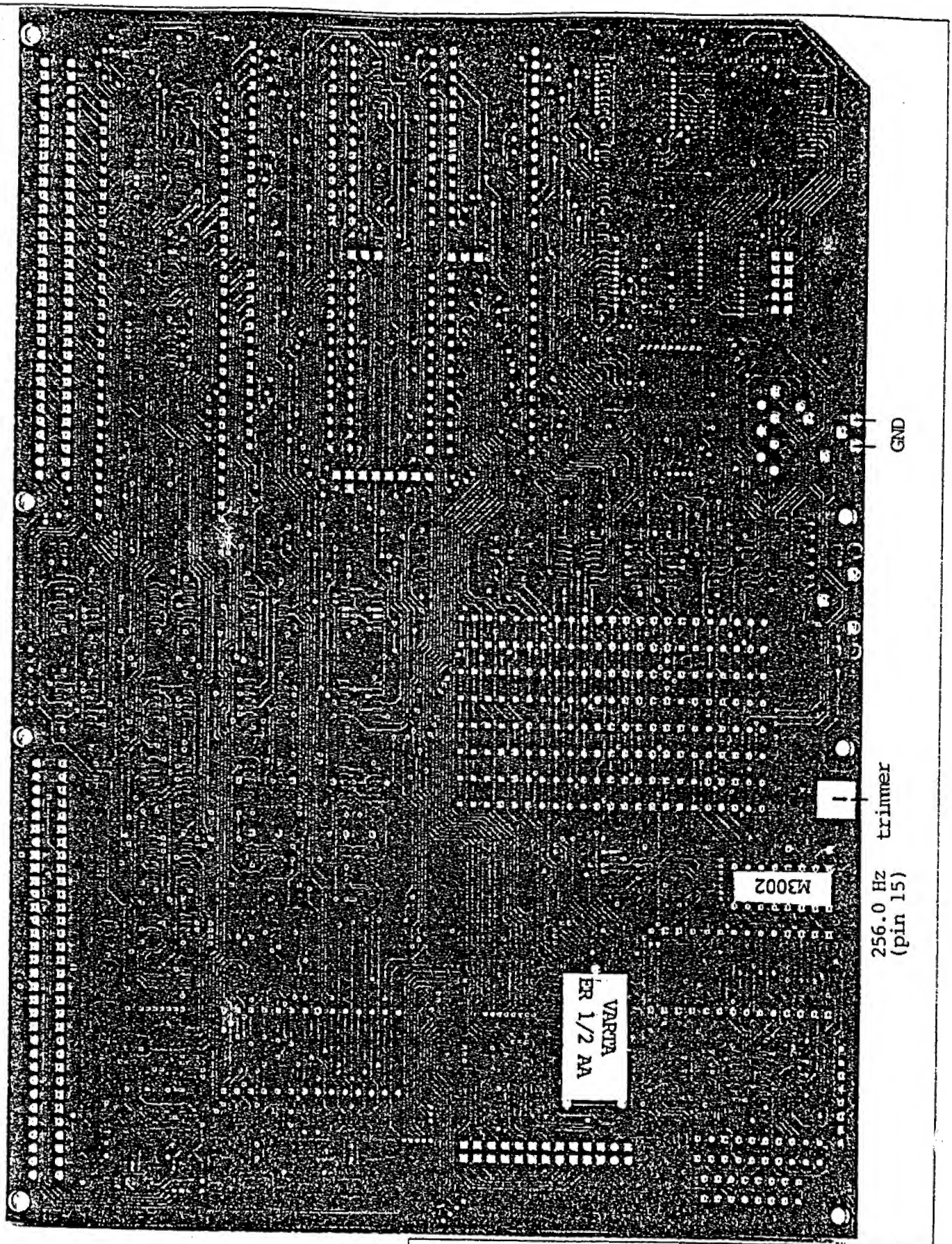
Das Erstzen des Boards ist einfach. Nachdem das neue Board eingesetzt ist, muss überprüft werden ob alle Muttern fest angezogen sind und ob die Verbindungskabel ST4 und ST5 richtig eingesteckt sind. Nullinien-Offset und Verstärkung der drei Schreibmodule MK1-7 müssen neu eingestellt werden.

3.2 Batterie ersetzen

Der Echtzeituhr-Schaltkreis ist von einer Lithium-Batterie gespiesen, die einen ununterbrochene Betrieb von bis zu 10 Jahren gewährleistet. Sobald die Spannung über der Batterie auf unter 2,0V fällt, muss sie ersetzt werden. Nachdem der Oberteil des Gehäuses entfernt worden ist, kann die alte Batterie ausgelötet werden. Die neue Batterie wird eingelötet und die Uhrenzeitbasis neu eingestellt.

3.3 Abgleich der Uhrenzeitbasis

Die Uhrenzeitbasis kann mit dem Trimmer neben dem IC M3000 oder M3002 mit Hilfe eines isolierten, kapazitätarmen Abgleichwerkzeuges eingestellt werden. Ein Rechteck-Signal von 256,0Hz ist am Pin 15 vom M3002 vorhanden. Falls dies nicht der Fall ist, muss der Wochentag einmal über die Tastatur eingegeben werden. Der Trimmer muss so eingestellt werden, dass eine sehr genaue Angabe auf dem Frequenzzähler erscheint.



SCHILLER AG, CH-6340 BAAR ALTGASSE 68			
TITLE SERVICE INFORMATION MK2-1C			
SIZE B	CODE	NUMBER 1100105 c	REV A
DATE 30 APRIL 1986		SHEET	

4. ECG AMPLIFIER BOARD

1. In the test mode, some diagnostic parameters of ECG amplifier appear on the LCD. The following values should be shown on the LCD in the first column:

Uref+ (positive reference voltage)		1950 . . . 2050mV
Uref- (negative reference voltage)		1950 . . . 2050mV
Udif (Uref+ minus Uref-)	target: 4000	3960 . . . 4040mV
Uoff (Uref+ plus Uref-) /2		-50 . . . +50mV
Calib. (Udif) / 4	target: 1000	990 . . . 1010mV
U+ (3.2*x)	target: 5Vi	1300 . . . 1900mV
U- (3.2*x)	target: -5Vi	-1300 . . . -1900mV

   NOTE: Slight deviations of the Udif may be adjusted in the field, but any other deviations require replacement of the board and repair by the manufacturer.

2. The second column on the LCD shows the offset value of the final amplifier stages. After pressing **R** (resetting) all values should lie within -400 to +400mV.

3. The third column (input DC-offset of the electrodes in mV) should show values between -40 and +40mV if the patient cable is shorted or an ECG simulator is connected.

4.1 Board Replacement

First remove the microprocessor board and remove the two posts that the microprocessor was screwed into. Rfer to Figure 2 for locations. Remove the Phillips screw located at the patient connector (Figure 2) and lift the board slightly. Gently pull it away from the interconnect board to remove.

4.2 Adjustment

In the test mode, adjust P1 on the ECG amplifier for a reading of 4000mV for Udif on the LCD. Refer to Figure 2 for P1 location.

4. EKG-VERSTÄRKER

1. Im Testmodus erscheinen einige diagnostische Parameter vom EKG-Verstärker auf dem LC-Bildschirm. Die folgenden Werte sollten angezeigt werden:

Uref+ (positive Referenzspannung)		1950 . . . 2050mV
Uref- (negative Referenzspannung)		1950 . . . 2050mV
Udif (Uref+ minus Uref-)	soll: 4000	3960 . . . 4040mV
Uoff (Uref+ plus Uref-) /2		-50 . . . +50mV
Calib. (Udif) / 4	soll: 1000	990 . . . 1010mV
U+ (3.2 * x)	soll: 5Vi	1300 . . . 1900mV
U- (3.2 * x)	soll: -5Vi	-1300 . . . -1900mV

   HINWEIS: Leichte Abweichungen von Udif vom Nominalwert können in der Servicestelle abgeglichen werden. Alle anderen Abweichungen von den Nominalwerten weisen auf Schaltdefekte hin und verlangen eine Ersetzung des fehlerhaften Boards, welches nur vom Hersteller repariert werden kann

2. Die zweite Kolonne zeigt die Offset-Werte der Leistungsverstärkungsstufen. Wenn die Taste **R** gedrückt wird, sollten die Werte zwischen -400 und +400mV liegen.

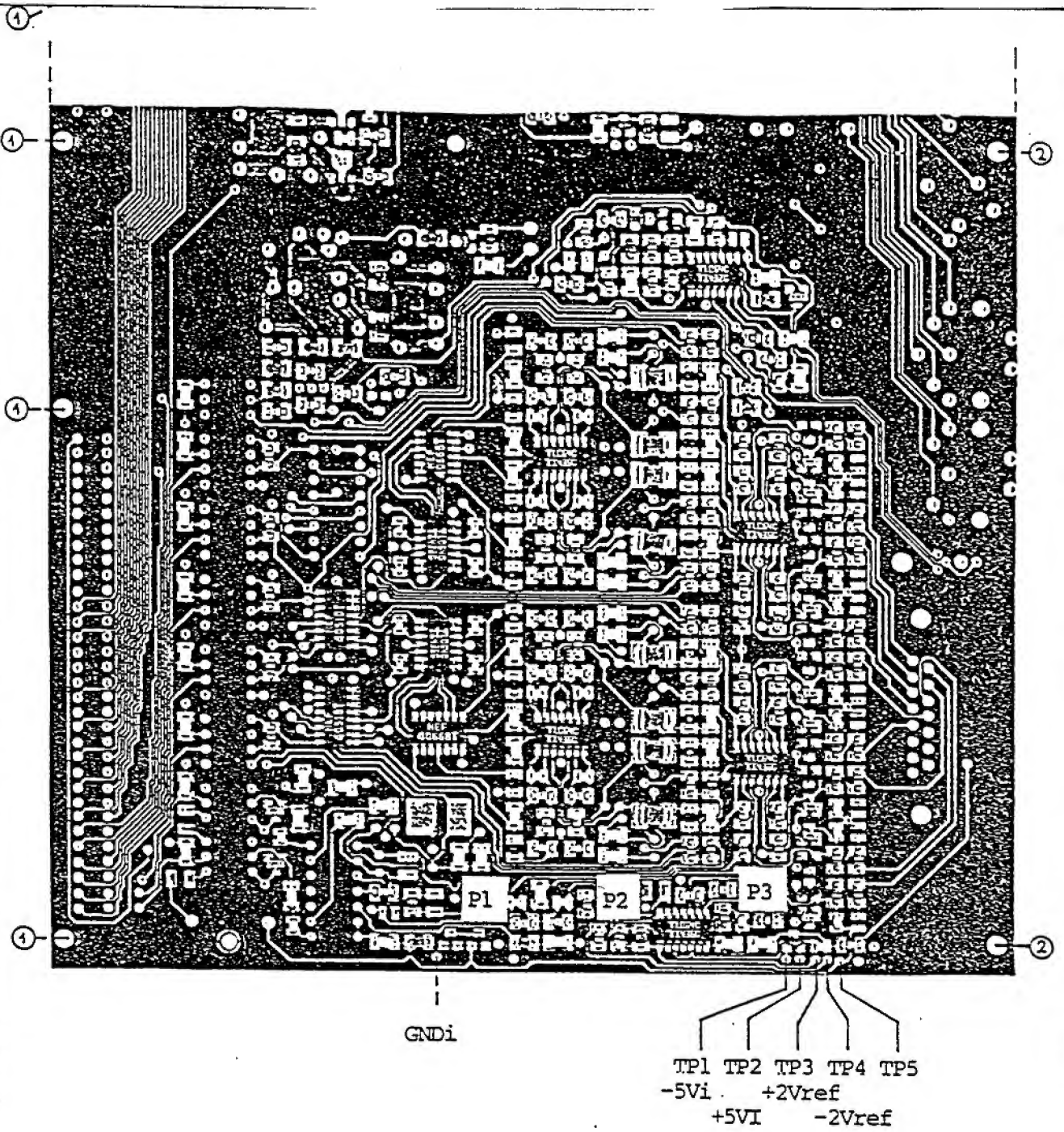
3. Die dritte Kolonne (Eingangsoffset-DC-Spannung der Elektroden in mV) sollte Werte zwischen -40 und +40mV aufweisen, wenn das Patientenkabel kurzgeschlossen oder mit einem Simulator verbunden ist.

4.1 Board ersetzen

Zuerst wird das µComputer-Board MK-1 entfernt. Dann müssen die vier Schreiben (1) und die zwei Distanzbolzen (2) entfernt werden. Nachdem die Kabel ST10 und ST19 ausgezogen sind, wird die Backplane MK1-4 zusammen mit dem EKG-Verstärker MK1-2 herausgenommen. Ein neues Board MK1-2 wird in die MK1-4 eingesteckt und alle Teile wieder eingebaut. Das Gerät wird in den Test-Modus geschalten (Taste **T** drücken). Die auf dem Bildschirm erschienenden Werte müssen nun geprüft werden. Die Erstzboards sind vorabgeglichen und benötigen keinen zusätzlichen Abgleich.

4.2 Abgleich

Zwischen den Testpunkten TP3 und TP4 wird der Spannungsunterschied gemessen. Mit Trimmer P2 wird die Spannung auf einen Wert von 4.0Vdc eingestellt. Im Test-Modus wird der Trimmer P1 der Wert von Udif auf dem Bildschirm 4000mV eingestellt.



Stück	Gegenstand / Spezifikation	Pos.	Material		Modell	Bemerkungen
1	Änderungen:				Ersetzt durch	

EKG-Verstärker
MK1-2A
SERVICE INFORMATION

SCHILLER AG, CH-6340 BAAR

1100205 c

5. ADJUSTMENT OF BATTERY CHARGER

The charging voltage of the battery is temperature dependent. Its vale is adjusted by means of R9 according to table 1. The charging voltage must be measured directly at the battery contacts.

IMPORTANT: Adjustment of the charging voltage must be done at low charging current (battery fully charged) !

5. EINSTELLUNG DER AKKUMULATOR LADESPANNUNG

Die Akkumulator Ladespannung ist abhängig von der Umgebungs-Temperatur. Sie wird mit R9 gemäss Tabelle 1 eingestellt. Gemessen wird die Ladespannung direkt am Akkumulator. Bei einer Kontrollmessung muss der gemessene Wert innerhalb des min. und max. Wertes der Tabelle sein.

WICHTIG: Die Einstellung der Ladespannung muss bei kleinem Ladestrom erfolgen (Akkumulator voll geladen), da durch die Erwärmung des Schalterreglers bei grossem Ladestrom (100mA) die Ladespannung etwas absinkt (ca. 0,8V).

TABLE / TABELLE 1
CHARGING VOLTAGE BETWEEN -10 AND +50°C
LADESPANNUNG ZWISCHEN -10 UND +50°C

Temp (°C)	min (V)	typ (V)	max (V)
-10	14.3	14.5	14.6
-5	14.1	14.3	14.5
0	14.0	14.2	14.3
5	13.9	14.1	14.2
10	13.7	13.9	14.1
15	13.6	13.8	13.9
16	13.6	13.8	13.9
17	13.55	13.75	13.9
18	13.55	13.75	13.85
19	13.55	13.7	13.85
20	13.5	13.7	13.8
21	13.5	13,65	13.8
22	13.45	13.65	13.75
23	13.45	13.6	13.75
24	13.45	13.6	13.7
25	13.4	13.55	13.7
26	13.4	13.55	13.65
27	13.35	13.5	13.65
28	13.35	13.5	13.6
29	13.35	13.45	13.6
30	13.3	13.45	13.55
31	13.3	13.4	13.55
32	13.25	13.4	13.55
33	13.25	13.4	13.5
34	13.25	13.35	13.5
35	13.25	13.35	13.45
40	13.15	13.25	13.4
45	13.1	13.2	13.3
50	13.05	13.1	13.25

6. ADJUSTMENT OF MOTOR DRIVE CURRENT

1. The current consumption of the stepper motor is measured across R55 (0.1 Ohm), corresponding to test points T1 and T2.

2. Set for manual mode 25mm/s and start motor.

3. Adjust R48 for a motor current of 90mA (equals 9mV voltage drop across R55).

IMPORTANT: Voltage probe must be isolated from ground potential!

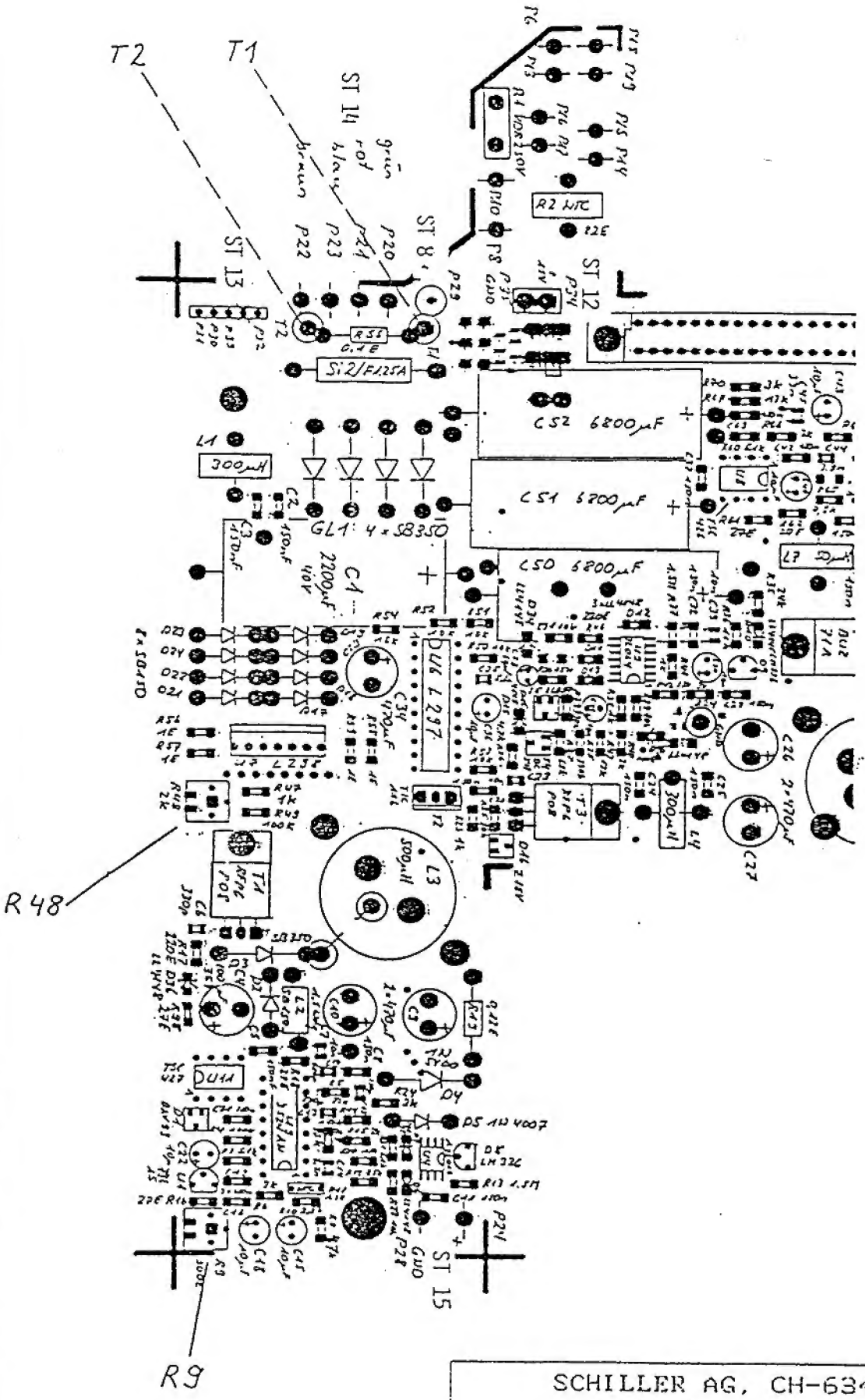
6. EINSTELLEN DES MOTORSTROMES

1. Die Stromaufnahme des Schrittmotores kann Spannungsmässig über einem eingebauten Messwiederstand (R55/0,1 Ohm) gemessen werden. Messpunkte T1 und T2.

2. Im Manuellen Betrieb Papiervorschub auf 25mm/s einstellen und Motor starten.

3. Mit R48 Motorstrom auf 90mA (entspricht 8mV über dem Messwiederstand R55) einstellen.

WICHTIG: Spannungs-Messung über dem Messwiederstand R55 erdungsfrei!



SCHILLER AG, CH-6340 BAAR ALTGASSE 68			
TITLE	POWER SUPPLY HK2-6 SERVICE INFORMATION		
SIZE B	CODE	NUMBER 1100685 d	REV A

7. PAPER MARK DETECTOR

The paper mark detector is used to sense the black mark which is on the paper. It tells the unit where to start printing and when to stop. If the unit is giving an error message of "CHECK PAPER" or "REFILL PAPER" the adjustment procedure should be carried out.

7.1 Adjustment

1. With your soldering iron and the two pieces of wire, attach one wire to point 'A' and the other to point 'B' on the interconnect board as shown on Figure 7.

   NOTE: It is easier to solder your wires on the circuit side of the board.

2. Connect your oscilloscope or meter to the end of each wire ('A' = '+' and 'B' = '-'). Run the wires to the outside of the unit and put the cover on, attaching all cables but the LCD again for ease of adjusting.

3. Turn the unit on. Press **3** (100mm/s) and **4** (+10). This puts the unit into 10mm/s speed. Press **M** to put the unit into manual recording mode. With your tweaker in one hand, pick up the top cover and reach inside the unit. Insert the tweaker into TR1 (refer to Figure 1).

4. Press the **START** key. Observe the scope or meter and adjust TR1 such that the following voltage levels are measured:

No paper mark:	0.4 - 0.6V
Paper mark:	3.5 - 4.0V

   NOTE: If there is a problem in getting the voltage to adjust down to 0.5V, you will need to check the physical placement of the paper sensor. The mount may be loose or the mount may have been bent in some way. If the mount is not loose, then bend the sensor mount slightly upwards. If you watch your scope or meter while doing this, and observe the voltage level, you can tell when it is in the right position.

When the adjustment is correct and paper runs with no error message, press the **STOP** key and turn the unit off. Remove the top case and the wires that were soldered to points 'A' and 'B'. Reassemble the unit and give a final check.

7. EINSTELLEN DES PAPIERMARKENDETEKTORS

Am R2 und GND Voltmeter oder Oscilloscope anschliessen. Papiervorschub auf 10mm/s und manueller Betrieb einstellen. Motor starten. Eingestellt wird TR1 so dass folgende Spannungspegel gemessen werden können:

keine Marke:	0,4 - 0,6V
Marke:	3,5 - 4,0V

8. PRINTER TIMER

The printer timer which is located on the underside of the top cover is responsible for setting up the timing to the printhead. This is dependent upon the paper speed and the millivolts per division.

This adjustment needs to be done if the printhead adjustment did not help the light printing or if there are dashes in the ECG.

8.1 Board Replacement

Remove the top cover and lay it so you are looking at the underside. Remove the two screws holding down the Printer Timer Board. Refer to Figure 3 for locations. Disconnect ST10 from the printhead and remove the board. Replace and secure it back down with the two screws.

8.2 Adjustment

1. Locate the Printer Timer Board (see Figure 3) and solder wire to R4 (see Figure 5).
2. Disconnect ST10 from the thermal printhead.
3. Connect a 30kOhm resistor between pins 3a and 4b on ST10 as shown in Figure 5.
4. Insert a wire into pin 2b of ST10 and another wire into 6b, 7b or 8b for GND connection. Refer to Figure 5 for location.
5. Put top cover back on unit and connect all cables, but the cable to the LCD. Refer to Figure 1. This will allow you to raise the cover to make your adjustments.
6. Connect your ground lead to the wire connected to either pin 6b, 7b or 8b and the positive to the wire connected to R4.
   CAUTION: Ensure that the wire going to pin 2b is not shorting to anything
7. Turn V2 fully counterclockwise. See Figure 5 for location. Turn the unit on (the LCD will not come on - it is disconnected).
8. Press key **1** (25mm/s) and key **4** (+10) to put the unit into 2.5mm/s. Then press key **M** to put the unit into Manual mode.
9. Press the **START** key and set charge time for C4 to 0.62ms by adjusting VR1. See Figure 6, diagram 1.
10. Press the **STOP** key and connect the probe to the wire in pin 2b of ST10.
11. Press the **START** key and adjust VR2 for the correct pulse width per Table 2 below. Refer to Figure 3 for the location of the resistance label on the printhead. Refer to Figure 6, diagram 2 for example.

When adjustment is set, turn the unit off and remove the cover. Disconnect all wires that were installed and connect ST10 back to the printhead.

Put the top cover back on, connecting all cables and ensure that the unit is operating correctly.

8. EINSTELLEN DES PRINTER-TIMER

1. Diese Einstellung ist bei ausgestecktem Thermo-kamm Anschluss vorzunehmen (ST10).
2. Am Stecker ST10 von Pin 3a zu Pin 4b ist ein Simulations-Wiederstand von 30kOhm/1% einzustecken.
3. Trimmer UR2 im Gegenuhrzeigersinn an den Anschlag drehen.
4. Oscilloscope an C4/R4 und GND anschliessen.
5. Im Manuell-Modus Papiervorschub starten (2,5mm/s).
6. Mit VR1 Ladezeit von C4 auf 0,62ms einstellen.
7. Oscilloscope an Pin 2b (ST10) anschliessen.
8. Mit VT2 negative Pulsdauer gemäss Tabelle 2 einstellen. Die Pulsdauer ist abhängig von der Thermo-Kamm Impedanz. Sie kann auf dem Thermo-Kamm abgelesen werden.
9. Papiervorschub stoppen und den Thermo-Kamm wieder anschliessen.

TABLE / TABELLE 2
PULSE WIDTHS

Resistance marked on printhead Wiederstandswerte Ohm	Pulse width Anstiegszeit µs
200	435
205	445
210	457
215	467
220	477
225	480
230	500
235	510
240	522
245	532
250	542
255	555
260	565
265	575
270	587
275	597
280	607

9. PRINTHEAD

The paper runs between the printhead and the paper roller on the paper tray. Therefore the pressure from one side of the printhead to the other side must be equal otherwise the paper will skew to one side. Also the printhead must be lined up with the paper roller.

There are two different adjustments which can be made for the printhead as follows:

9.1 Skew Adjustment

Remove the printhead cover by removing the two screws holding it on. Refer to Figure 4. With the paper running at 25mm/s, adjust the two screws marked Skew in Figure 4 so that the paper does not run off to one side.

9.2 Light Printing Adjustment

With the paper running at 25mm/s and a simulator attached, adjust the two screws marked Alignment for the darkest print possible.

NOTE: If printing is still not dark enough, you should carry out the printer timer adjustment.

9. EINSTELLEN DES THERMO-KAMMES

1. abnehmen der Kammabdeckung; 2 Schrauben herausdrehen.
2. EKG-Signal einspeisen (Simulator), 10mm/s Papiervorschub und manuell Modus einstellen.
3. Mit den zwei Schrauben, die parallel zur Papierauslauffläche liegen, kann der Thermo-Kamm eingestellt werden. (auf maximale Schwärze einstellen)
4. Kammabdeckung mit 2 Schrauben montieren.

10. LCD DISPLAY - REMOVAL AND REPLACEMENT

10.1 Removing the LCD Display

1. Open up the unit as described in para. 2.
2. Remove the paper compartment cover.
2. Turn the top cover upside down.
3. Unplug the cable connecting the thermal printhead to the interface print.
4. Remove the two screws securing the thermal printhead.
5. Remove the thermal printhead (watch out for the washer and the pressure spring!).
6. Remove the four securing screws and remove the LCD display.
7. Make sure that any debris resulting from a broken or cracked screen are also removed (bits may be lying loose under the LCD display).

10.2 Installing an LCD Display

1. If necessary, inserta new screen and install the LCD display securing it with the four screws (protective washers).
2. Take the thermal printhead and place the two pressure springs in their respective indentations ensuring that the washers are located exactly over the securing holes.
3. Locate the thermal printhead ensuring that the washers are not displaced.
4. Secure the printhead with the two screws (protective washers).
5. Plug the connecting cable into the interface print.
6. Plug in the connecting cables at the back (LCD display, thermal printhead interface, paper mark detector) then with the top cover partially closed, attach the four remaining cables (thermal printhead, power connection, single cable for keyboard, motor connection, keyboard).

   NOTE: Make sure that the connections for the motor, thermal printhead power connection and the single cable for the keyboard are lying on top of the mains transformer.

7. Secure the unit with the four screws.
8. Insert the white contrast knob into its recess on the right-hand side of the unit.
9. Replace the paper compartment cover.

10. ANLEITUNG ZUM WECHSELN DES LC DISPLAYS

10.1 Ausbau des LCD Displays

1. Auf der rechten Seite des Gerätes weissen Drehknopf für die LCD Einstellung herausziehen.
2. 4 Schrauben am Boden des Gerätes herausdrehen.
3. Geräteoberteil langsam nach hinten aufklappen und alle Verbindungskabel ausstecken.
4. Papierfach-Deckel entfernen und Geräteoberteil auf den Kopf stellen.
5. Verbindungskabel vom Thermo-Kamm zum Interface-Print ausstecken.
6. Thermo-Kamm herausnehmen (die Unterlagsscheiben und Andruckfedern beachten!).
7. 4 Befestigungsschrauben herausdrehen und LCD herausnehmen.
8. Bei gebrochener oder gerissener Schutzscheibe auch diese herausnehmen (liegt lose in der Vertiefung unter dem LCD Display).

10.2 Einbau des LCD Displays

1. (evt.) neue Schtzscheibe einlegen und neuer LCD Display einlegen.
2. LCD mit 4 Schrauben befestigen (Sicherungsunterlagsscheiben)
3. Darauf achten, dass die zwei Andruckfedern in der entsprechenden Vertiefung stehen und die Unterlagsschieben genau auf den Befestigungs-Löchern des Thermo-Kammes liegen.
4. Thermo-Kamm einlegen (darauf achten, dass sie Unterlagsscheiben nicht verschoben werden).
5. Kamm mit 2 Schrauben befestigen (Sicherungsunterlagsscheiben).
6. Verbindungskabel zu Interface-Print einstecken
7. Zuerts die hinteren Verbindungskabel einstecken (LCD-Display, Thermo-Kamm Interface, Papiermarken Detektor), dann mit etwa halb zugeklapptem Geräteoberteil die restlichen 4 Kabel einstecken (Thermo-Kamm Pweranschluss, Einzelkabel von der Tastatur, Motoranschluss, Tastatur).
8. Darauf achten, dass die Verbindungen von Motor, Thermo-Kamm Poweranschluss und Einzelleitung von der Tastatur über den Netztransformer zu liegen kommen.
9. Gerät mit 4 Schrauben zusammen schrauben.
10. Weisser Drehknopf für die LCD-Displayeinstellung einstecken.
11. Papierfach-Deckel einsetzen.

11. ANNUAL PREVENTIVE MAINTENANCE AND CALIBRATION

1. Electronic calibration & checks

a. µProcessor Pcb: RTCC (real time clock circuit) 256.000 Hz check and calibration. Gold lithium battery check (Vout ≥ 2.8 Vdc, nominal 3.7 Vdc).

b. ECG amplifier Pcb: +2 Vdc & -2Vdc reference Voltage calibration. PWM ramp time (4000 factor on the TEST display). ± 5 Vdc supply of the DC/DC converter /Tolerance on both supply = 200 mV). The on board high voltage discharge protection bulb must be checked (no electrode contact !). Output fuses of the scope & load line (Ohmic test). Test of each High pass capacitor by applying + 100 mV dc offset to the input of the filter and pressing the reset key function (the offset line should be kept straight without moving away). Functional test of the ECG Pcb with a real patient. Cable test function must be checked with a good and a bad cable.

c. Power supply: every single supply must be measured by a D.V.M. (under load), no adjustment only check.

d. Printer timer \ Paper mark detection and stepper motor ad/check must be done. The printer timer 2nd monoflop must be measured according to the printer head impedance and re-calibrated if needed (Tolerance ± 10 µs).

e. Battery charge voltage calibration & check

f. The battery capacity shall be tested in continuous Rhythm mode. The AT-6 shall work for at least 1 1/2 hrs (battery must be previously fully charged). If not, the 12 V battery shall be exchanged.

g. The battery protection fuse (2A, s.b) needs to be checked

h. Check on power supply MK2-6 (Batt. charge circuit) for square wave signal Vss 30V at 54 kHz (between 47 and 60 kHz)

j. The display contrast adjustment needs to be checked (from max..min).

2. Mechanical adj, replacement / Test:

a. paper table: The paper table rubber cylinder Schiller P/N 4.410046 (including the cylinder bearing, P/N 4.410041) may be exchanged after 1 Year of use (optional). The cylinder Nylon gear must be optically checked and if needed exchanged. After exchanging the rubber cylinder and readjusting the printer timer monoflop, the unit must show good printing results. If not, recheck with the lowest speed in manual mode at 12 CH and activate the 1 mV function continuously.

b. Printer head readjustment (optional) only with weight gauge.

c. Photocell replacement and readjustment (P/N 3.900703)

d. Keyboard test (each key shall be depressed and correctly decoded)

3. Accessories

The patient cable shall be thoroughly measured and tested incl. all peripheral connectors.

4. Cleaning procedures:

The electronic board compartment needs to be free of dust (air pressure low to clean) and kept free of any acids or aggressive solutions (optical checks). For cleaning the machine and Pcb we advise to use any solution like Alcohol mixed with Freon (50/50), Incidin, Amocid, etc.
ATTENTION: the LCD screen shall be only cleaned with a soap/water mix.

AT-6 BOTTOM CASE OVERVIEW
W/MICROPROCESSOR

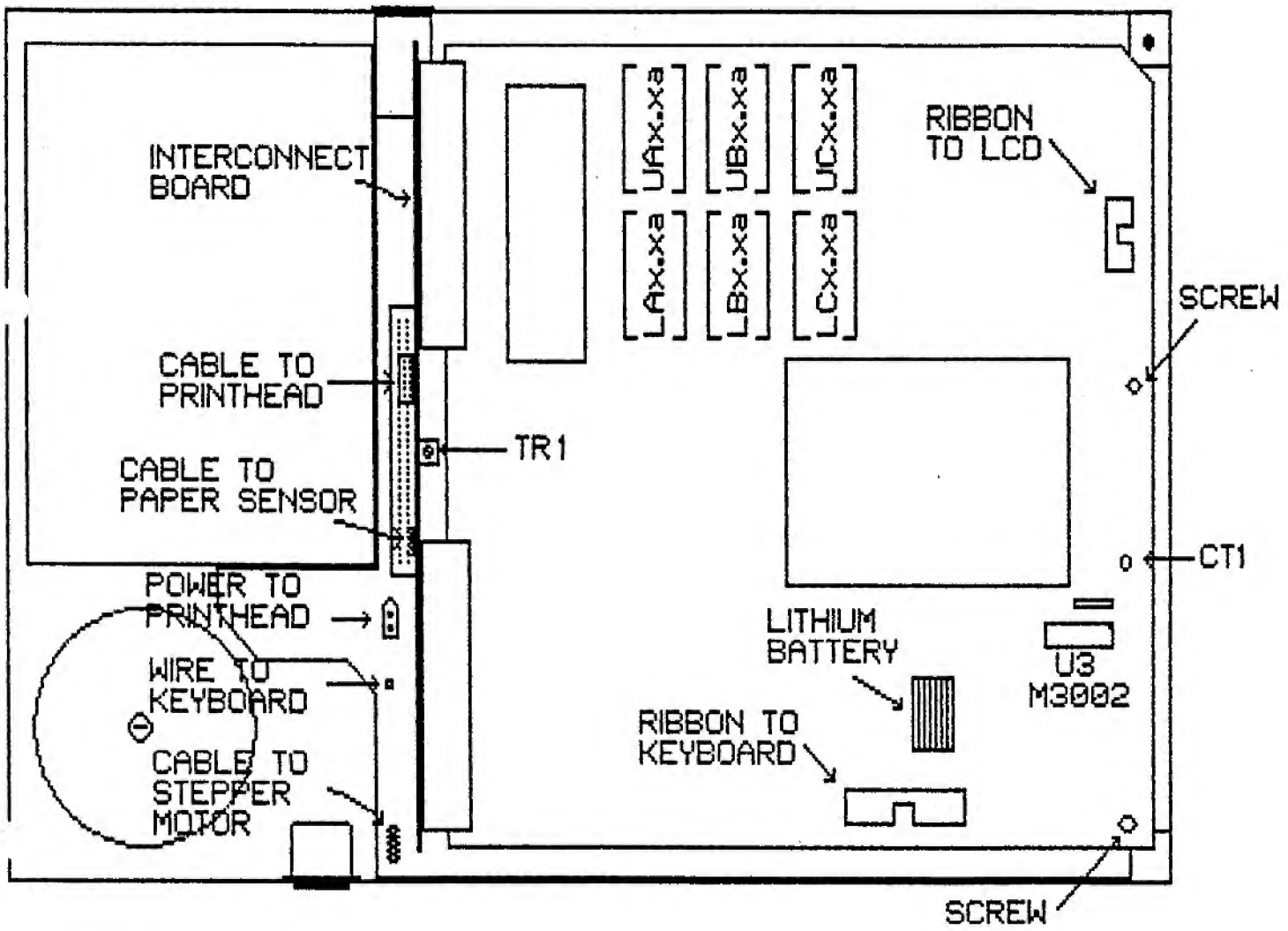


FIGURE 1

AT-6 BOTTOM CASE OVERVIEW
W/ECG AMPLIFIER

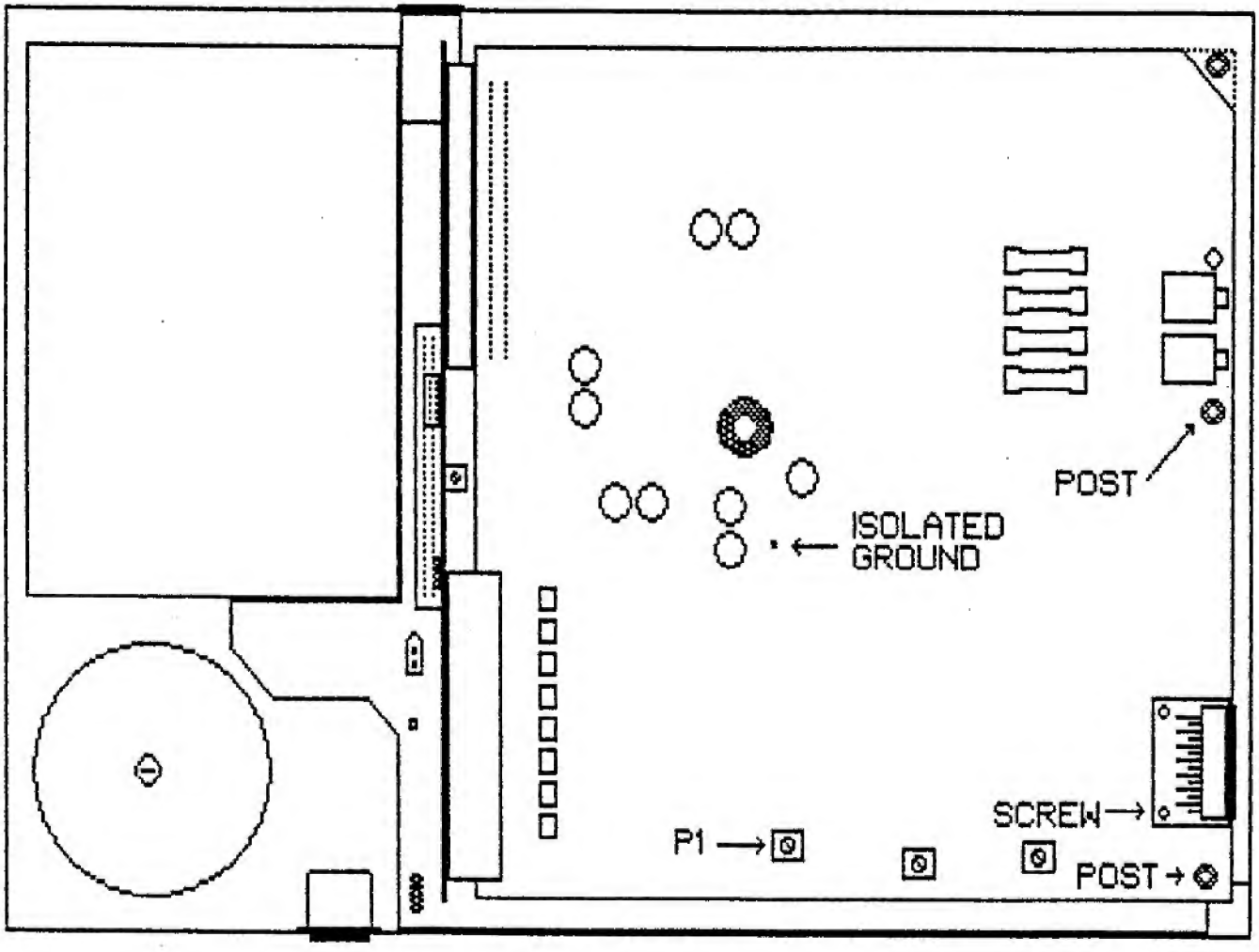


FIGURE 2

AT-6 TOP COVER

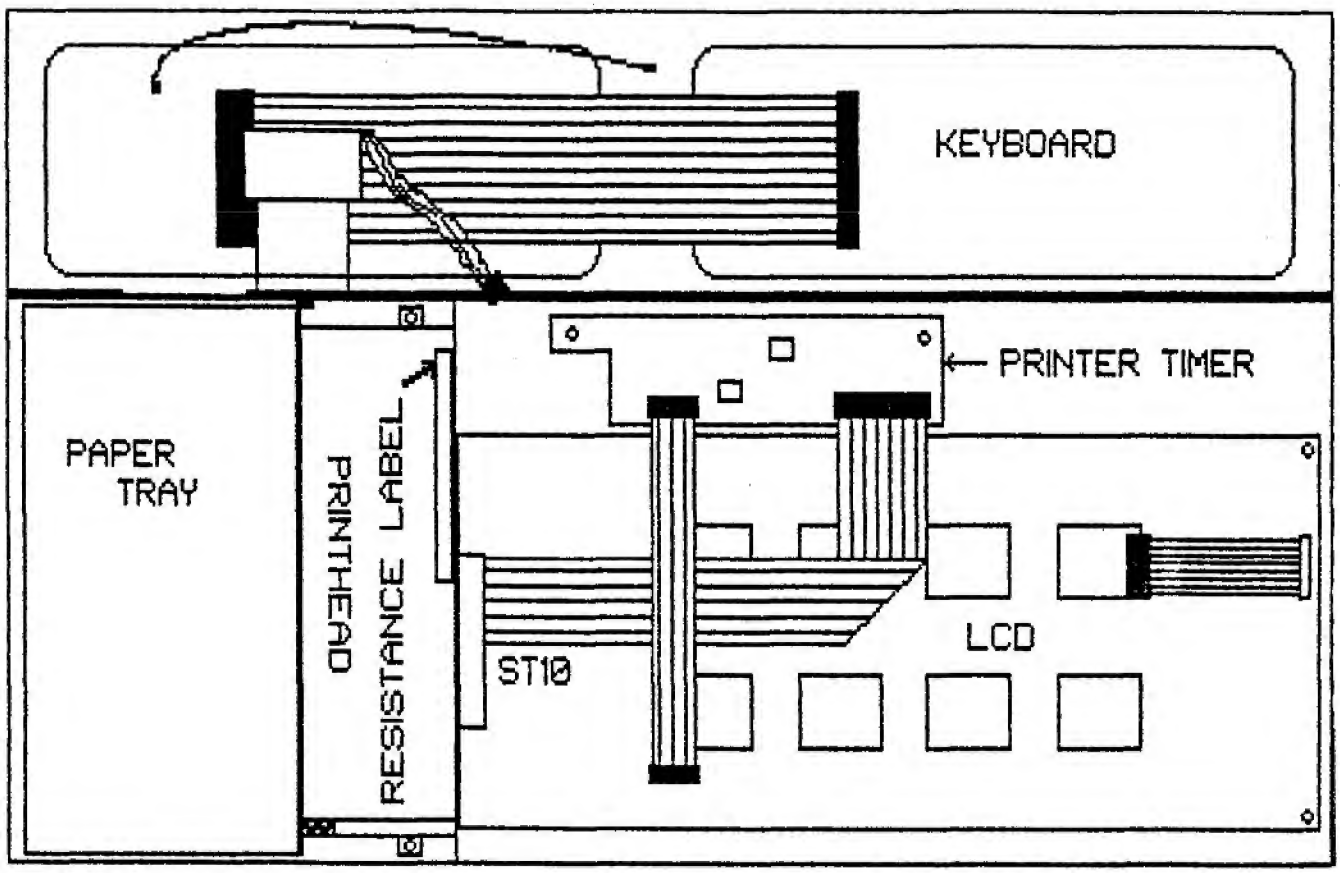


FIGURE 3

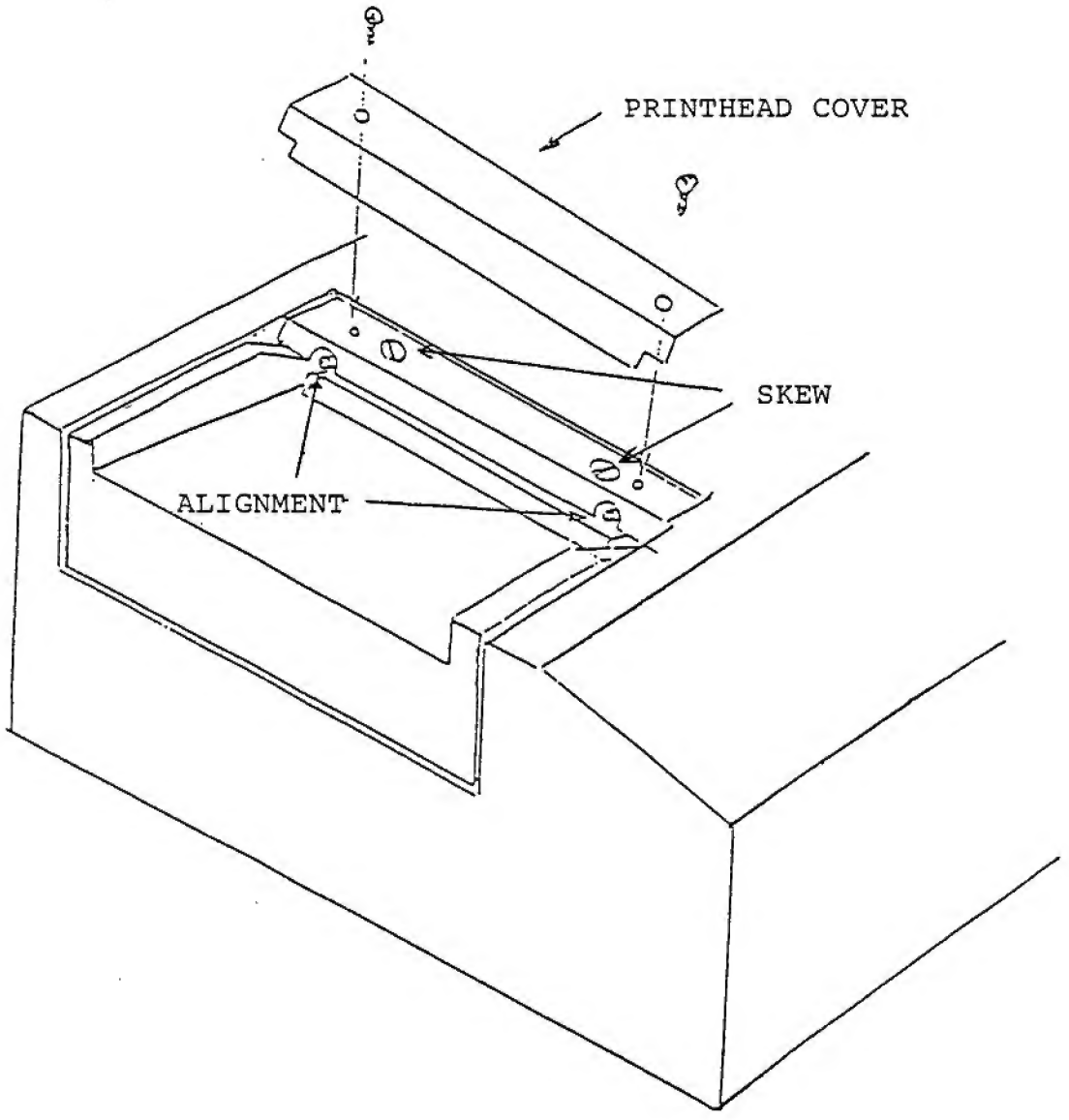


FIGURE 4

PRINTER TIMER

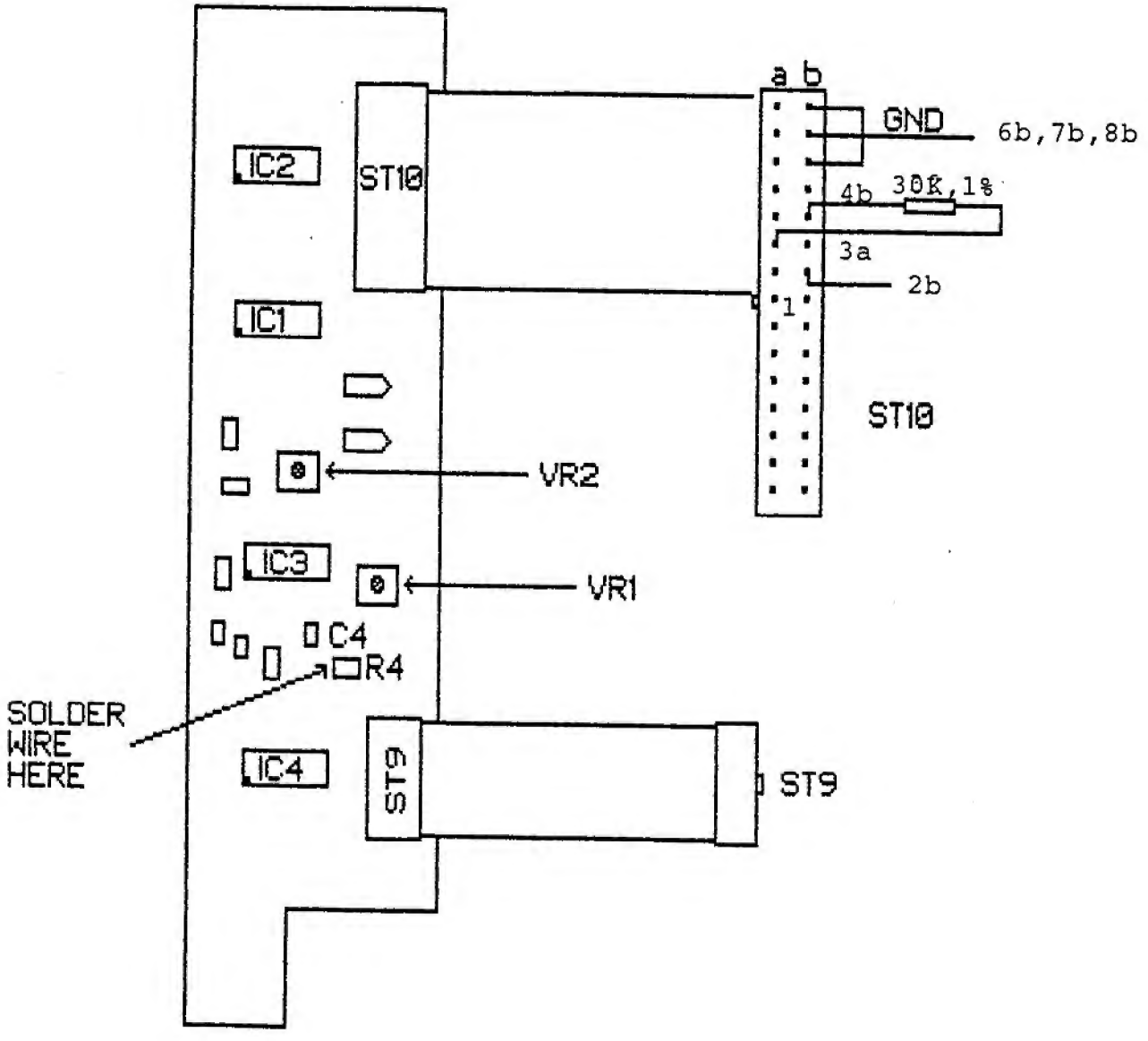


FIGURE 5

DIAGRAM 1

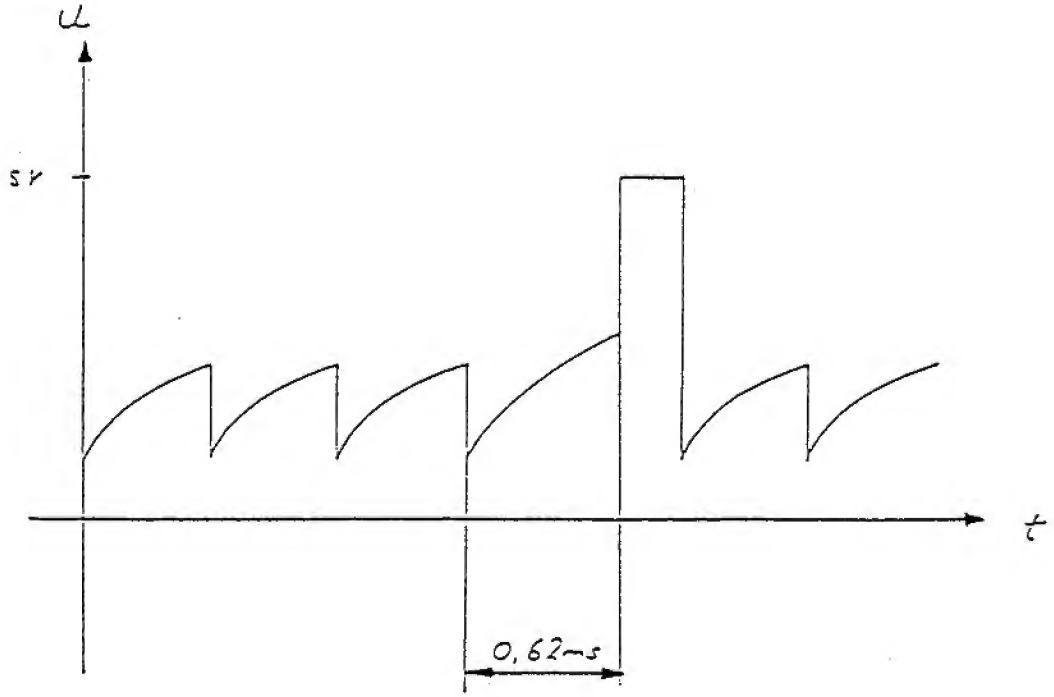


DIAGRAM 2

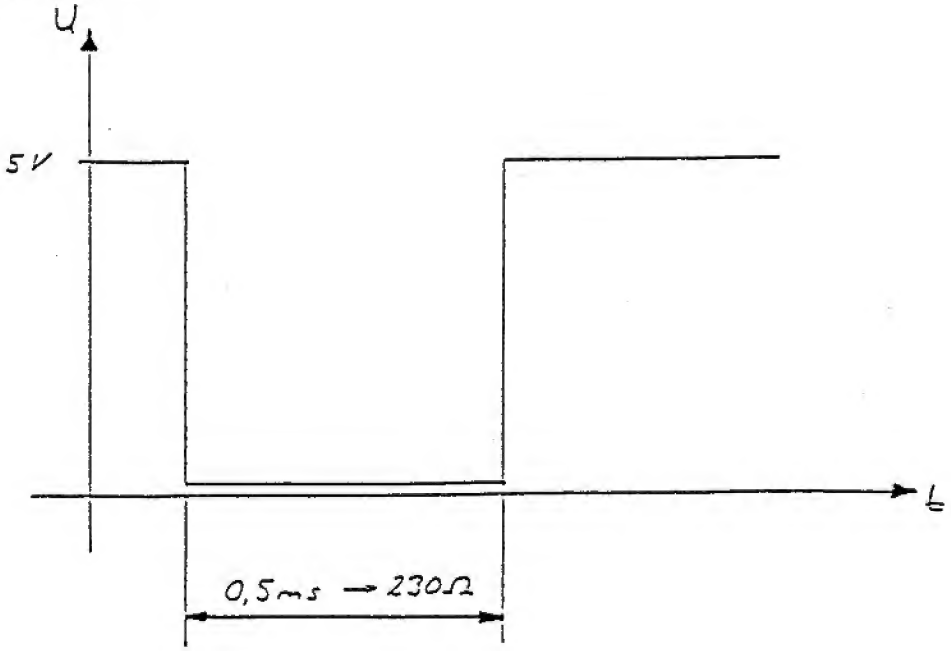


FIGURE 6

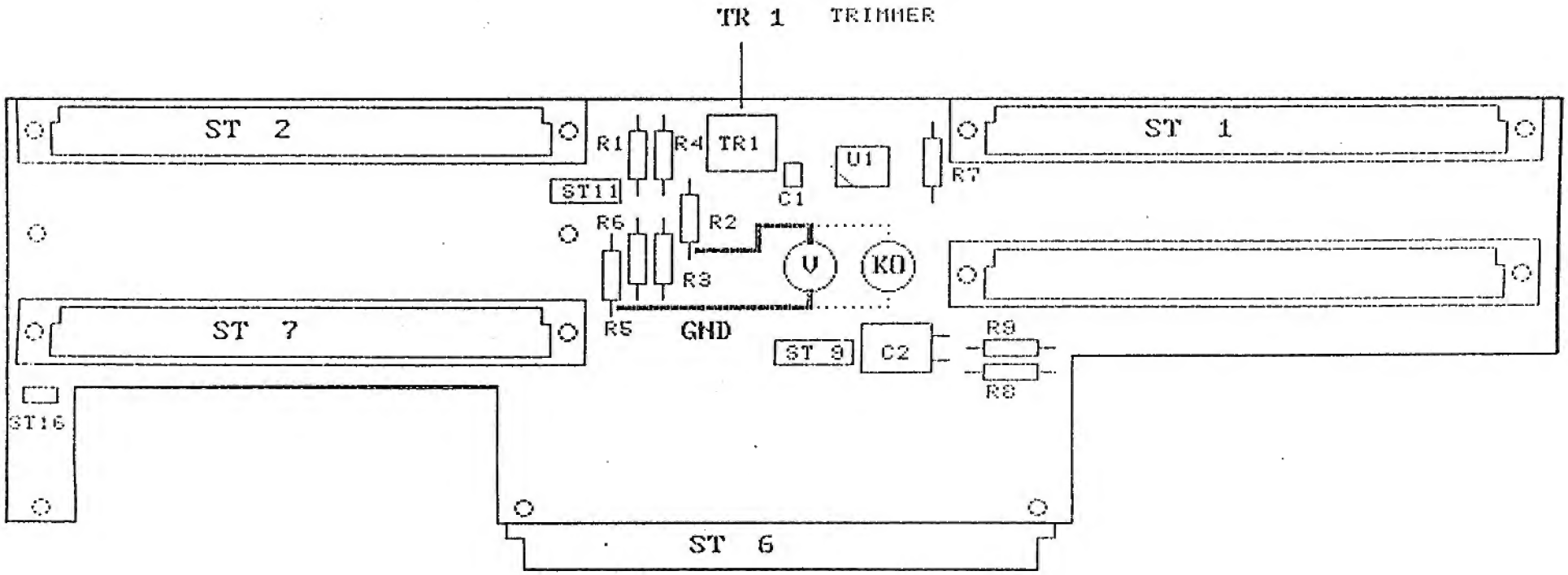


FIGURE 7

SCHILLER AG, CH-6340 BAAR ALTGASSE 68			
TITLE: BACKPLANE MK2-4 SERVICE INFORMATION			
SIZE: B	CODE:	NUMBER: 1100405 b	REV: A
DATE: 9. OKT. 1986		SHEET:	

SECTION 9

SPARE PARTS LIST

tufe	Pos.	Artikel-Nr.	Menge	ME	Gr	Bezeichnung	Typ	T	D	P	Nr	S1	S2	S3	Bedarf
		3.100149		ST		MK2-1D uP-Print AT-6	1								1.0000
	001				01	StÜckliste Index -			0						
	002				01	Stand 03.12.88			0						
	003				01	----------			0						
	050	4.490136	1.000	ST	01	uP-Print MK2-1D	0	0	1	0	00	00	00	00	1.0000
	051				01	----------			0						
	096				01	Halbleiter			0						
	097				01	----------			0						
	100	4.650028	1.000	ST	01	uP 68HC000P10	0	0	1	0	00	00	00	00	1.0000
	101				01	U1			0						
	105	4.655007	1.000	ST	01	673201	0	0	1	0	00	00	00	00	1.0000
	106				01	U16			0						
	110	4.655011	1.000	ST	01	93C46 SMD	0	0	1	0	00	00	00	00	1.0000
	111				01	U23,U55			0						
	120	4.655002	1.000	ST	01	MSM 82C53 - 5GS	0	0	1	0	00	00	00	00	1.0000
	121				01	U2			0						
	125	4.655001	1.000	ST	01	MSM 6240 GSK	0	0	1	0	00	00	00	00	1.0000
	126				01	U17			0						
	130	4.650032	1.000	ST	01	MK 4501N-15	0	0	1	0	00	00	00	00	1.0000
	131				01	U31			0						
	135	3.100183	1.000	ST	01	MK2-11 Ausf. AT-6	1	0	1	0	00	00	00	00	1.0000
	140	4.650023	2.000	ST	01	HN 27C256G-20	0	0	1	0	00	00	00	00	2.0000
	141				01	U47,U48			0						
	145	4.655003	3.000	ST	01	HM 6264 LFP-15	0	0	1	0	00	00	00	00	3.0000
	146				01	U20,U45,U46			0						
	150	4.625003	1.000	ST	01	ADC 0809 FN	0	0	1	0	00	00	00	00	1.0000
	151				01	U59			0						
	155	4.650029	1.000	ST	01	DAC 8408 HP	0	0	1	0	00	00	00	00	1.0000
	156				01	U54			0						
	160	4.675000	1.000	ST	01	TL 7705 ACD	0	0	1	0	00	00	00	00	1.0000
	161				01	U4			0						
	165	4.650018	1.000	ST	01	M 3002 B	0	0	1	0	00	00	00	00	1.0000
	166				01	U3			0						
	170	4.625000	1.000	ST	01	TL 062 CD	0	0	1	0	00	00	00	00	1.0000
	171				01	U58			0						
	175	4.625001	2.000	ST	01	TL064CD	0	0	1	0	00	00	00	00	2.0000
	176				01	U56,U57			0						
	180	4.645001	1.000	ST	01	74HC02 SMD	0	0	1	0	00	00	00	00	1.0000

tufe	Pos.	Artikel-Nr.	Menge	ME	Gr	Bezeichnung	Typ	T	D	P	Nr	S1	S2	S3	Bedarf
	181				01	U30			0						
	185	4.645002	2.000	ST	01	74HC04 SMD	0	0	1	0	00	00	00	00	2.0000
	186				01	U14,U15			0						
	190	4.645004	4.000	ST	01	74HC32 SMD	0	0	1	0	00	00	00	00	4.0000
	191				01	U8,U9,U32,U60			0						
	195	4.645006	1.000	ST	01	74HC112 SMD	0	0	1	0	00	00	00	00	1.0000
	196				01	U29			0						
	200	4.645007	3.000	ST	01	74HC138 SMD	0	0	1	0	00	00	00	00	3.0000
	201				01	U5,U6,U13			0						
	205	4.645018	1.000	ST	01	74HC139 SMD	0	0	1	0	00	00	00	00	1.0000
	206				01	U7			0						
	210	4.645008	2.000	ST	01	74HC151 SMD	0	0	1	0	00	00	00	00	2.0000
	211				01	U10,U28			0						
	215	4.645017	1.000	ST	01	74HC174 SMD	0	0	1	0	00	00	00	00	1.0000
	216				01	U11			0						
	220	4.645011	7.000	ST	01	74HC257 SMD	0	0	1	0	00	00	00	00	7.0000
	221				01	U25,U26,U27,U33,U34,U35			0						
	222				01	U40			0						
	225	4.645012	1.000	ST	01	74HC259 SMD	0	0	1	0	00	00	00	00	1.0000
	226				01	U22			0						
	230	4.645013	1.000	ST	01	74HC390 SMD	0	0	1	0	00	00	00	00	1.0000
	231				01	U24			0						
	235	4.645014	1.000	ST	01	74HC393 SMD	0	0	1	0	00	00	00	00	1.0000
	236				01	U12			0						
	240	4.645016	3.000	ST	01	74HC573 SMD	0	0	1	0	00	00	00	00	3.0000
	241				01	U18,U19,U21			0						
	245	4.665104	1.000	ST	01	LM 336 BM 5.0	0	0	1	0	00	00	00	00	1.0000
	246				01	D1			0						
	295				02	----------			0						
	296				02	Kondensatoren			0						
	297				02	----------			0						
	300	4.861100	2.000	ST	02	Chip 10 pf 0805	0	0	1	0	00	00	00	00	2.0000
	301				02	C4,C7			0						
	305	4.861330	5.000	ST	02	Chip 33 pf 0805	0	0	1	0	00	00	00	00	5.0000
	306				02	C5,C8,C18,C19,C6			0						
	310	4.861121	1.000	ST	02	Chip 120 pf 0805	0	0	1	0	00	00	00	00	1.0000
	311				02	C2			0						
	315	4.861392	3.000	ST	02	Chip 3,9 nF 0805	0	0	1	0	00	00	00	00	3.0000
	316				02	C12,C14,C16			0						

tufe	Pos.	Artikel-Nr.	Menge	ME	Gr	Bezeichnung	Typ	T	D	P	Nr	S1	S2	S3	Bedarf
	320	4.861103	3.000	ST	02	Chip 10 nf 0805	0	0	1	0	00	00	00	00	3.0000
	321				01	C13,C15,C17			0						
	325	4.861333	25.000	ST	02	Chip 33 nf 0805	0	0	1	0	00	00	00	00	25.0000
	326				02	C9,C10,C11,C20,C21,C22			0						
	327				02	C23,C27,C28,C29,C30,C31			0						
	328				02	C32,C33,C34,C35,C36,C37			0						
	329				02	C38,C39,C40,C41,C42,C43			0						
	330				02	C44			0						
	335	4.861104	1.000	ST	02	Chip 100 nf 1206	0	0	1	0	00	00	00	00	1.0000
	336				02	C1			0						
	340	4.845006	1.000	ST	01	Tantal 10uF/16V	0	0	1	0	00	00	00	00	1.0000
	341				02	C3			0						
	345	4.845004	1.000	ST	02	Tantal 68uF/6V	0	0	1	0	00	00	00	00	1.0000
	346				02	C24			0						
	350	4.845002	2.000	ST	02	Tantal 33uF/15V	0	0	1	0	00	00	00	00	2.0000
	351				02	C25,C26			0						
	355	4.840003	1.000	ST	02	Tantal 2.2uF/16V (35V)	0	0	1	0	00	00	00	00	1.0000
	356				02	C46			0						
	395				03	----------			0						
	396				03	Widerstände			0						
	397				03	----------			0						
	400	4.715471	9.000	ST	03	Chip 470 Ohm 2% 1206	0	0	1	0	00	00	00	00	9.0000
	401				03	R2,R20,R22,R23,R24,R25			0						
	402				03	R26,R27,R29			0						
	405	4.715472	2.000	ST	03	Chip 4,7 k Ohm 2% 1206	0	0	1	0	00	00	00	00	2.0000
	406				03	R1,R19			0						
	410	4.715103	1.000	ST	03	Chip 10 k Ohm 2% 1206	0	0	1	0	00	00	00	00	1.0000
	411				03	R6			0						
	415	4.715153	7.000	ST	03	Chip 15 k Ohm 2% 1206	0	0	1	0	00	00	00	00	7.0000
	416				03	R7,R9,R10,R12,R13,R15,R16			0						
	420	4.715303	3.000	ST	03	Chip 30 k Ohm 2% 1206	0	0	1	0	00	00	00	00	3.0000
	421				03	R8,R11,R14			0						
	430	4.715335	2.000	ST	03	Chip 3,3 M Ohm 2% 1206	0	0	1	0	00	00	00	00	2.0000
	431				03	R3,R4			0						
	435	4.716153	2.000	ST	03	Melf 15 k Ohm 1% 0204	0	0	1	0	00	00	00	00	2.0000
	436				03	R16,R18			0						
	440	4.721007	3.000	ST	03	7x10k	0	0	1	0	00	00	00	00	3.0000
	441				03	R21,R28,R30			0						
	445	4.722001	2.000	ST	01	Netzwerk 5x47k	0	0	1	0	00	00	00	00	2.0000

tufe	Pos.	Artikel-Nr.	Menge	ME	Gr	Bezeichnung	Typ	T	D	P	Nr	S1	S2	S3	Bedarf
	446				03	R31,R32			0						
	450	4.715473	2.000	ST	01	Chip 47 k Ohm 2% 1206	0	0	1	0	00	00	00	00	2.0000
	451				01	R33,R34			0						
	495				04	----------			0						
	496				04	Quarze			0						
	497				04	----------			0						
	500	4.680007	1.000	ST	04	Quarz NMP 24.0 MHz	0	0	1	0	00	00	00	00	1.0000
	501				04	Q3			0						
	505	4.685001	1.000	ST	04	Quarz CX-1V 32.768 A	0	0	1	0	00	00	00	00	1.0000
	506				04	Q2			0						
	510	4.680006	1.000	ST	04	Quarz NMP 20.0 MHz	0	0	1	0	00	00	00	00	1.0000
	511				04	Q1			0						
	595				05	----------			0						
	596				05	Div. Komponenten			0						
	597				05	----------			0						
	600	4.855000	1.000	ST	05	Trimmer 5-40pF	0	0	1	0	00	00	00	00	1.0000
	601				05	CT1			0						
	605	4.736001	1.000	ST	05	4,7 k PCV 215/30	0	0	1	0	00	00	00	00	1.0000
	606				05	P1			0						
	610	4.350003	1.000	ST	01	Lith. Batterie 3V CS/AT	0	0	1	0	00	00	00	00	1.0000
	611				05	B1			0						
	615	4.260064	2.000	ST	05	Messerleiste 41612 geb.	0	0	1	0	00	00	00	00	2.0000
	616				05	ST1,ST2			0						
	620	4.261023	1.000	ST	05	26-pol. Wanne gebogen	0	0	1	0	00	00	00	00	1.0000
	621				05	ST5			0						
	625	4.261022	1.000	ST	05	10-pol. Wanne gebogen	0	0	1	0	00	00	00	00	1.0000
	626				05	ST4			0						
	630	4.260036	1.000	ST	05	Stereo-Klinkenbuchse 3,5	0	0	1	0	00	00	00	00	1.0000
	631				05	ST3A			0						
	640	4.250009	1.000	ST	05	IC-Sockel 64 pol.	0	0	1	0	00	00	00	00	1.0000
	641				05	U1			0						
	645	4.250007	6.000	ST	05	IC-Sockel 28 pol.	0	0	1	0	00	00	00	00	6.0000
	646				05	U47,U48,U49,U50,U51,U52			0						
	650	4.917000	4.000	ST	05	Linsenk.schraube 2,9x6,5	0	0	1	0	00	00	00	00	4.0000
	655	4.530010	1.000	ST	05	Kabelbinder 300 mm	0	0	1	0	00	00	00	00	1.0000
	900				01	----------			0						
	901				01	19.04.88 Umstellung von			0						
	902				01	10uF/6V auf 10uF/16V			0						
	903				01	----------			0						

Stufe	Pos.	Artikel-Nr.	Menge	ME	Gr	Bezeichnung	Typ	T	D	P	Nr	S1	S2	S3	Bedarf
	904				01	03.12.88 DF MS					0				
	905				01	R31,R32 alt 5x100k - 47k					0				
	906				01	R34 alt 100k neu 47k					0				
	907				01	----------					0				
	908				01	07.12.88 Umstellung von					0				
	909				01	TM 4256 EA4-15L auf Print					0				
	910				01	MK2-11					0				
	911				01	----------					0				

tufe	Pos.	Artikel-Nr.	Menge	ME	Gr	Bezeichnung	Typ	T	D	P	Nr	S1	S2	S3	Bedarf
		3.100139		ST		MK1-2C EKG Verst. AT-6	1								1.0000
	001				01	Stückliste Index -			0						
	002				01	Stand 16.11.88 999			0						
	003				01	----------			0						
	030	4.490132	1.000	ST	01	EKG-Print MK1-2C	0	0	1	0	00	00	00	00	1.0000
	031				01	----------			0						
	046				01	Halbleiter			0						
	047				01	----------			0						
	050	4.625001	11.000	ST	01	TL064CD	0	0	1	0	00	00	00	00	11.0000
	051				01	IC1,IC2,IC3,IC4,IC5,IC6			0						
	052				01	IC7,IC8,IC9,IC10,IC11			0						
	055	4.625000	2.000	ST	01	TL 062 CD	0	0	1	0	00	00	00	00	2.0000
	056				01	IC12,IC20			0						
	060	4.620009	1.000	ST	01	TL084CN	0	0	1	0	00	00	00	00	1.0000
	061				01	IC13			0						
	065	4.635000	1.000	ST	01	4013 SMD	0	0	1	0	00	00	00	00	1.0000
	066				01	IC14			0						
	070	4.635004	2.000	ST	01	4051 SMD	0	0	1	0	00	00	00	00	2.0000
	071				01	IC15,IC16			0						
	075	4.635005	2.000	ST	01	4066 SMD	0	0	1	0	00	00	00	00	2.0000
	076				01	IC17,IC18			0						
	080	4.630012	1.000	ST	01	14551	0	0	1	0	00	00	00	00	1.0000
	081				01	IC19			0						
	085	4.615002	12.000	ST	01	BC 847 B	0	0	1	0	00	00	00	00	12.0000
	086				01	T1,T2,T3,T4,T5,T6,T7,T8			0						
	087				01	T9,T10,T11,T12			0						
	090	4.615003	1.000	ST	01	BC857B	0	0	1	0	00	00	00	00	1.0000
	091				01	T13			0						
	095	4.615053	2.000	ST	01	IRFS 1Z0 TRL	0	0	1	0	00	00	00	00	2.0000
	096				01	T14,T15			0						
	100	4.610059	8.000	ST	01	2N4393	0	0	1	0	00	00	00	00	8.0000
	101				01	T16,T17,T18,T19,T20,T21			0						
	102				01	T22,T23			0						
	105	4.610058	1.000	ST	01	J 270	0	0	1	0	00	00	00	00	1.0000
	106				01	T24			0						
	110	4.670016	2.000	ST	01	MP 5010 GN	0	0	1	0	00	00	00	00	2.0000
	111				01	D1,D2			0						
	115	4.670005	2.000	ST	01	LM 385 2,5V	0	0	1	0	00	00	00	00	2.0000

Stufe	Pos.	Artikel-Nr.	Menge	ME	Gr	Bezeichnung	Typ	T	D	P	Nr	S1	S2	S3	Bedarf
	116				01	D5,D16			0						
	120	4.665001	12.000	ST	01	MMBD914	0	0	1	0	00	00	00	00	12.0000
	121				01	D5,D6,D7,D8,D9,D10,D11			0						
	122				01	D12,D13,D14,D15,D16			0						
	125	4.660017	2.000	ST	01	1N5817	0	0	1	0	00	00	00	00	2.0000
	126				01	D17,D18			0						
	130	4.665002	18.000	ST	01	BAV99	0	0	1	0	00	00	00	00	18.0000
	131				01	D19,D20,D21,D22,D23,D24			0						
	132				01	D25,D26,D27,D28,D29,D30			0						
	133				01	D31,D32,D33,D34,D35,D36			0						
	135	4.600001	1.000	ST	01	4N26	0	0	1	0	00	00	00	00	1.0000
	136				01	OP3			0						
	140	4.600009	7.000	ST	01	6 N 136	0	0	1	0	00	00	00	00	7.0000
	141				01	OP4,OP5,OP6,OP7,OP8,OP1			0						
	142				01	OP2			0						
	145	4.665102	2.000	ST	01	BZX84C4V3LT1 4.3V	0	0	1	0	00	00	00	00	2.0000
	146				01	D45,D46			0						
	150	4.665000	4.000	ST	01	BAR 43 S	0	0	1	0	00	00	00	00	4.0000
	151				01	D47,D48,D49,D50			0						
	177				02	----------			0						
	178				02	WiderstÄnde			0						
	179				02	----------			0						
	180	4.715000	1.000	ST	02	Chip 0 Ohm	0	0	1	0	00	00	00	00	1.0000
	181				02	R236			0						
	185	4.715270	4.000	ST	02	Chip 27 Ohm 2% 1206	0	0	1	0	00	00	00	00	4.0000
	186				02	R207,R208,R209,R210			0						
	190	4.715620	6.000	ST	02	Chip 62 Ohm 2% 1206	0	0	1	0	00	00	00	00	6.0000
	191				02	R122,R123,R203,R204,R205			0						
	192				02	R206			0						
	195	4.715101	5.000	ST	02	Chip 100 Ohm 2% 1206	0	0	1	0	00	00	00	00	5.0000
	196				02	R144,R145,R152,R153,R154			0						
	200	4.715161	8.000	ST	02	Chip 160 Ohm 2% 1206	0	0	1	0	00	00	00	00	8.0000
	201				02	R80,R81,R82,R83,R84,R85			0						
	202				02	R86,R87			0						
	205	4.715561	5.000	ST	02	Chip 560 Ohm 2% 1206	0	0	1	0	00	00	00	00	5.0000
	206				02	R133,R134,R135,R136,R137			0						
	210	4.715112	24.000	ST	02	Chip 1,1 K OHM 2% 1206	0	0	1	0	00	00	00	00	24.0000
	211				02	R39,R40,R41,R42,R43,R44			0						
	212				02	R46,R47,R96,R97,R98,R99			0						

tufe	Pos.	Artikel-Nr.	Menge	ME	Gr	Bezeichnung	Typ	T	D	P	Nr	S1	S2	S3	Bedarf
	213				02	R100,R101,R102,R103,R118			0						
	214				02	R119,R120,R121,R151,R213			0						
	215				02	R217			0						
	220	4.715132	3.000	ST	02	Chip 1,3 k Ohm 2% 1206	0	0	1	0	00	00	00	00	3.0000
	221				02	R138,R140,R158			0						
	225	4.716202	8.000	ST	02	Melf 2,0 k Ohm 1% 0204	0	0	1	0	00	00	00	00	8.0000
	226				02	R72,R73,R74,R75,R76,R77			0						
	227				02	R78,R79			0						
	230	4.715272	1.000	ST	02	Chip 2,7 k Ohm 2% 1206	0	0	1	0	00	00	00	00	1.0000
	231				02	R141			0						
	235	4.717392	9.000	ST	02	Melf 3,9 k 0,1% 0204	0	0	1	0	00	00	00	00	9.0000
	236				02	R19,R20,R21,R22,R23,R24			0						
	237				02	R25,R26,R27			0						
	240	4.715512	2.000	ST	01	Chip 5,1 k Ohm 2% 1206	0	0	1	0	00	00	00	00	2.0000
	241				01	R125,R124			0						
	245	4.715752	1.000	ST	02	Chip 7,5 k Ohm 2% 1206	0	0	1	0	00	00	00	00	1.0000
	246				02	R130			0						
	250	4.715103	3.000	ST	01	Chip 10 k Ohm 2% 1206	0	0	1	0	00	00	00	00	3.0000
	251				01	R211,R215,R220			0						
	252				02	R9,R10,			0						
	255	4.716153	29.000	ST	02	Melf 15 k Ohm 1% 0204	0	0	1	0	00	00	00	00	29.0000
	256				02	R1,R2,R3,R4,R5,R6,R7,R8			0						
	257				02	R9,R10,R56,R57,R58,R59			0						
	258				02	R60,R61,R62,R63,R114			0						
	259				02	R115,R126,R127,R127,R129,			0						
	260				02	R131,R132,R155,R156			0						
	261				02	R160			0						
	265	4.715203	1.000	ST	02	Chip 20 k Ohm 2% 1206	0	0	1	0	00	00	00	00	1.0000
	266				02	R142			0						
	270	4.716303	25.000	ST	01	Melf 30 k Ohm 1% 0204	0	0	1	0	00	00	00	00	25.0000
	271				02	R11,R12,R13,R14,R15,R16			0						
	272				02	R17,R18,R48,R49,R50,R51			0						
	273				02	R53,R54,R55,R139,R147			0						
	274				01	R148,R189,R195,R212			0						
	275				02	R221,R228,R233			0						
	280	4.716333	3.000	ST	02	Melf 33 k Ohm 1% 0204	0	0	1	0	00	00	00	00	3.0000
	281				02	R112,R113,R146			0						
	285	4.717393	11.000	ST	02	Melf 39 k 0,1% 0204	0	0	1	0	00	00	00	00	11.0000
	286				02	R28,R29,R30,R31,R32,R33			0						

Stufe	Pos.	Artikel-Nr.	Menge	ME	Gr	Bezeichnung	Typ	T	D	P	Nr	S1	S2	S3	Bedarf
	287				02	R34,R35,R36,R37,R38			0						
	290	4.716473	15.000	ST	02	Melf 47 k Ohm 1% 0204	0	0	1	0	00	00	00	00	15.0000
	291				02	R88,R89,R90,R91,R92,R93			0						
	292				02	R94,R95,R116,R159,R197			0						
	293				02	R198,R199,R218,R219			0						
	295	4.716753	8.000	ST	02	Melf 75 k Ohm 1% 0204	0	0	1	0	00	00	00	00	8.0000
	296				02	R165,R172,R180,R186,R190			0						
	297				02	R193,R234,R235			0						
	300	4.716154	33.000	ST	02	Melf 150 k Ohm 1% 0204	0	0	1	0	00	00	00	00	33.0000
	301				02	R117,R149,R157,R161,R162			0						
	302				02	R163,R164,R166,R167,R168			0						
	303				02	R169,R170,R171,R173,R174			0						
	304				02	R175,R176,R177,R178,R179			0						
	305				02	R181,R182,R183,R184,R185			0						
	306				02	R187,R191,R192,R194,R196			0						
	307				02	R222,R223,R224			0						
	310	4.715155	9.000	ST	02	Chip 1,5 M Ohm 5% 1206	0	0	1	0	00	00	00	00	9.0000
	311				02	R104,R105,R106,R107,R108			0						
	312				02	R109,R110,R111,R225			0						
	315	4.715335	2.000	ST	02	Chip 3,3 M Ohm 2% 1206	0	0	1	0	00	00	00	00	2.0000
	316				02	R150,R214			0						
	320	4.715184	1.000	ST	02	Chip 180 k Ohm 2% 1206	0	0	1	0	00	00	00	00	1.0000
	321				02	R216			0						
	325	4.711156	8.000	ST	02	15M 1/4W 1%	0	0	1	0	00	00	00	00	8.0000
	326				02	R64,R65,R66,R67,R68,R69,			0						
	327				02	R70,R71			0						
	397				04	----------			0						
	398				04	Trimmer			0						
	399				04	----------			0						
	400	4.732500	1.000	ST	04	Potmeter 50 Ohm liegend	0	0	1	0	00	00	00	00	1.0000
	401				04	R230			0						
	405	4.732202	1.000	ST	04	Potmeter 2 k liegend	0	0	1	0	00	00	00	00	1.0000
	406				04	R231			0						
	410	4.732103	1.000	ST	04	Potmeter 10 k liegend	0	0	1	0	00	00	00	00	1.0000
	411				04	R232			0						
	497				05	----------			0						
	498				05	Kondensatoren			0						
	499				05	----------			0						
	500	4.861121	11.000	ST	05	Chip 120 pf 0805	0	0	1	0	00	00	00	00	11.0000

Stufe	Pos.	Artikel-Nr.	Menge	ME	Gr	Bezeichnung	Typ	T	D	P	Nr	S1	S2	S3	Bedarf
	501				05	C10,C11,C12,C13,C14,C15			0						
	502				05	C16,C17,C18,C79,C80			0						
	505	4.861221	2.000	ST	05	Chip 220 pf 0805	0	0	1	0	00	00	00	00	2.0000
	506				05	C72,C73			0						
	510	4.861391	1.000	ST	05	Chip 390 pf 0805	0	0	1	0	00	00	00	00	1.0000
	511				05	C123			0						
	515	4.862391	9.000	ST	05	Chip 390 pF/200V 0805	0	0	1	0	00	00	00	00	9.0000
	516				05	C1,C2,C3,C4,C5,C6,C7,C8			0						
	517				05	C9			0						
	520	4.861681	13.000	ST	05	Chip 680 pf 0805	0	0	1	0	00	00	00	00	13.0000
	521				05	C96,C97,C98,C99,C100,C101			0						
	522				05	C102,C103,C104,C105,C106			0						
	523				05	C107,C110			0						
	525	4.861152	2.000	ST	05	Chip 1,5 nF 0805	0	0	1	0	00	00	00	00	2.0000
	526				05	C74,C111			0						
	530	4.862152	1.000	ST	05	Chip 1,5 nF 1% 1206	0	0	1	0	00	00	00	00	1.0000
	531				05	C66			0						
	535	4.861392	14.000	ST	05	Chip 3,9 nF 0805	0	0	1	0	00	00	00	00	14.0000
	536				05	C37,C38,C39,C40,C41,C42			0						
	537				05	C43,C44,C61,C62,C75,C77			0						
	538				05	C122,C124			0						
	540	4.861153	14.000	ST	05	Chip 15 nf 0805	0	0	1	0	00	00	00	00	14.0000
	541				05	C53,C54,C55,C56,C57,C58			0						
	542				05	C59,C60,C76,C109,C112			0						
	543				05	C113,C114,C115			0						
	545	4.861104	22.000	ST	05	Chip 100 nf 1206	0	0	1	0	00	00	00	00	22.0000
	546				05	C19,C20,C63,C64,C69,C70			0						
	547				05	C71,C78,C81,C82,C89,C90			0						
	548				05	C91,C92,C93,C94,C116,C117			0						
	549				05	C118,C119,C120,C121			0						
	555	4.861154	16.000	ST	05	Chip 150 nf	0	0	1	0	00	00	00	00	16.0000
	556				05	C21,C22,C23,C24,C25,C26			0						
	557				05	C27,C28,C45,C46,C47,C48			0						
	558				05	C49,C50,C51,C52			0						
	560	4.861224	8.000	ST	05	Chip 220 nf 1812	0	0	1	0	00	00	00	00	8.0000
	561				05	C29,C30,C31,C32,C33,C34			0						
	562				05	C35,C36			0						
	565	4.845000	4.000	ST	05	Tantal 1.0uF/16V	0	0	1	0	00	00	00	00	4.0000
	566				05	C65,C68,C108,C127			0						

Stufe	Pos.	Artikel-Nr.	Menge	ME	Gr	Bezeichnung	Typ	T	D	P	Nr	S1	S2	S3	Bedarf
	570	4.845002	1.000	ST	05	Tantal 33uF/15V	0	0	1	0	00	00	00	00	1.0000
	571				05	C67			0						
	575	4.820011	9.000	ST	05	Elko 100 uF/35V stehend	0	0	1	0	00	00	00	00	9.0000
	576				05	C83,C84,C85,C86,C87,C88			0						
	577				05	C95,C125,C126			0						
	597				06	----------			0						
	598				06	InduktivitÄten			0						
	599				06	----------			0						
	600	4.320048	1.000	ST	01	Ringkern MK1-2	1	0	1	0	00	00	00	00	1.0000
	601				06	L1			0						
	605	4.320041	3.000	ST	06	Drossel 4,7 uH	0	0	1	0	00	00	00	00	3.0000
	606				06	L2,L3,L4			0						
	697				07	----------			0						
	698				07	Div. Komponenten			0						
	699				07	----------			0						
	705	4.210001	4.000	ST	07	Sicherung 100 mAF 5x20	0	0	1	0	00	00	00	00	4.0000
	706				00	Si1,Si2,Si3,Si4			0						
	710	4.210051	6.000	ST	01	Sicherungsfeder 751.0056	0	0	1	0	00	00	00	00	6.0000
	711				07	zu Sicherung			0						
	712				01	Si1,Si2,Si3			0						
	715	4.260064	1.000	ST	07	Messerleiste 41612 geb.	0	0	1	0	00	00	00	00	1.0000
	716				07	St7			0						
	720	4.600006	1.000	ST	07	PrÜf-Schaltbuchse grÜn	0	0	1	0	00	00	00	00	1.0000
	725	4.260178	1.000	ST	01	MAB 5 SH abgeschliffen	1	0	1	0	00	00	00	00	1.0000
	726				07	B3			0						
	730	4.260179	1.000	ST	01	MAB 6 H abgeschliffen	1	0	1	0	00	00	00	00	1.0000
	731				07	B2			0						
	735	4.260045	1.000	ST	07	15 pol.D-Stecker abg.wbl.	0	0	1	0	00	00	00	00	1.0000
	736				07	B1			0						
	740	4.260036	2.000	ST	01	Stereo-Klinkenbuchse 3,5	0	0	1	0	00	00	00	00	2.0000
	741				01	BU4,BU5			0						
	745	4.912008	1.000	ST	07	Blech.Senk.Kreuz. 2,2x13	0	0	1	0	00	00	00	00	1.0000
	750	4.260055	2.000	ST	07	D-Steckerbolzen m.Mutter	0	0	1	0	00	00	00	00	2.0000
	751				07	B1			0						
	755	4.260085	1.000	ST	07	Teststift vergoldet	0	0	1	0	00	00	00	00	1.0000
	760	4.240013	8.000	ST	07	Transistor Montagescheibe	0	0	1	0	00	00	00	00	8.0000
	761				07	T16,T17,T18,T19,T20,T21			0						
	762				07	T22,T23			0						
	765	4.917000	2.000	ST	07	Linsenk.schraube 2,9x6,5	0	0	1	0	00	00	00	00	2.0000

Stufe	Pos.	Artikel-Nr.	Menge	ME	Gr	Bezeichnung	Typ	T	D	P	Nr	S1	S2	S3	Bedarf
	770	4.260054	1.000	ST	07	15 pol.Kunststoffwinkel	0	0	1	0	00	00	00	00	1.0000
	775	4.910011	2.000	ST	07	Kreuzschlitzschr. M2.5x8	0	0	1	0	00	00	00	00	2.0000
	780	4.920002	2.000	ST	07	Mutter M 2,5 (d=0,5)	0	0	1	0	00	00	00	00	2.0000
	785	4.930029	2.000	ST	01	Fächerscheibe M2,6	0	0	1	0	00	00	00	00	2.0000
	790	4.120311	1.000	ST	01	Sicherungsbez. Kleber	0	0	1	0	00	00	00	00	1.0000
	900				01	----------			0						
	901				01	16.11.88 HP			0						
	902				01	Umstellung DC/DC Wandler			0						
	903				01	auf Ringkern 4.320048			0						
	904				01	Überspannungsableiter			0						
	905				01	entfällt.			0						
	908				01	Umstellung BSS 87 auf			0						
	909				01	IRFS1Z0 T14,T15			0						
	910				01	R153 alt 2k neu 100 Ohm			0						
	911				01	R154 alt 2k neu 100 Ohm			0						
	912				01	R216 alt 150k neu 180k			0						
	997				01	----------			0						
	998				01	Stückliste 3.100 158			0						
	999				01	----------			0						

Stufe	Pos.	Artikel-Nr.	Menge	ME	Gr	Bezeichnung	Typ	T	D	P	Nr	S1	S2	S3	Bedarf
		3.100142		ST		MK2-3 Keyboard AT-6	1								1.0000
	001				01	StÜckliste Index -			0						
	002				01	Stand 10.04.87			0						
	003				01	----------			0						
	050	4.490112	1.000	ST	01	AT-6 Keyboard MK2-3	0	0	1	0	00	00	00	00	1.0000
	051				01	----------			0						
	096				01	Halbleiter			0						
	097				01	----------			0						
	100	4.610013	1.000	ST	01	2N2907A	0	0	1	0	00	00	00	00	1.0000
	101				01	T1			0						
	105	4.660013	8.000	ST	01	1N4148	0	0	1	0	00	00	00	00	8.0000
	106				01	D1,D2,D3,D4,D5,D6,D7,D8			0						
	110	4.600023	5.000	ST	01	MV 64B LED grÜn	0	0	1	0	00	00	00	00	5.0000
	111				01	D9,D10,D11,D12,D13			0						
	195				02	----------			0						
	196				02	WiderstÄnde			0						
	197				01	----------			0						
	200	4.711102	1.000	ST	02	1KO 1/4W 1%	0	0	1	0	00	00	00	00	1.0000
	201				02	R18			0						
	205	4.722005	1.000	ST	02	4x220 Ohm	0	0	1	0	00	00	00	00	1.0000
	206				02	R13,R14,R15,R16			0						
	210	4.711221	1.000	ST	02	220 OHM 1/4W 1%	0	0	1	0	00	00	00	00	1.0000
	211				02	R17			0						
	295				03	----------			0						
	296				03	Div. Komponenten			0						
	297				03	----------			0						
	300	4.520021	1.000	ST	03	AT-6 Keyboardkabel	0	0	1	0	00	00	00	00	1.0000
	305	4.520022	1.000	ST	03	AT-6 Verbindungsdraht	0	0	1	0	00	00	00	00	1.0000
	898				09	----------			0						
	899				09	Anderungen			0						
	900				09	2.4.87 LED Farbe wechselt			0						
	901				09	Alte Artnr 4.600 003 rot			0						
	902				09	Neue Artnr 4.600 023 grÜn			0						
	903				09	----------			0						

tufe	Pos.	Artikel-Nr.	Menge	ME	Gr	Bezeichnung	Typ	T	D	P	Nr	S1	S2	S3	Bedarf
		3.100143		ST		MK2-4 Backplane AT-6	1								1.0000
	001				01	Stückliste Index -			0						
	002				01	Stand 10.11.87			0						
	003				01	----------			0						
	050	4.490114	1.000	ST	01	Backplane MK2-4	0	0	1	0	00	00	00	00	1.0000
	051				01	----------			0						
	096				01	Widerstände und Potmeter			0						
	097				01	----------			0						
	100	4.711100	1.000	ST	01	10 OHM 1/4W 1%	0	0	1	0	00	00	00	00	1.0000
	101				01	R8			0						
	105	4.711102	2.000	ST	01	1KO 1/4W 1%	0	0	1	0	00	00	00	00	2.0000
	106				01	R1,R2			0						
	110	4.711202	1.000	ST	01	2KO 1/4W 1%	0	0	1	0	00	00	00	00	1.0000
	111				01	R5			0						
	115	4.711302	1.000	ST	01	3KO 1/4W 1%	0	0	1	0	00	00	00	00	1.0000
	116				01	R4			0						
	120	4.711103	3.000	ST	01	10K 1/4W 1%	0	0	1	0	00	00	00	00	3.0000
	121				01	R3,R6,R9			0						
	125	4.711474	1.000	ST	01	470K 1/4W 1%	0	0	1	0	00	00	00	00	1.0000
	126				01	R7			0						
	130	4.733503	1.000	ST	01	Potmeter 50 k stehend	0	0	1	0	00	00	00	00	1.0000
	195				02	----------			0						
	196				02	Kondensatoren			0						
	197				02	----------			0						
	200	4.810102	1.000	ST	02	1nF/100V Keramikkond.	0	0	1	0	00	00	00	00	1.0000
	201				02	C1			0						
	205	4.820011	1.000	ST	02	Elko 100 uF/35V stehend	0	0	1	0	00	00	00	00	1.0000
	206				02	C2			0						
	295				03	----------			0						
	296				03	Div. Komonenten			0						
	297				03	----------			0						
	300	4.620047	1.000	ST	03	LP 311 N	0	0	1	0	00	00	00	00	1.0000
	301				01	IC1			1						
	305	4.260110	1.000	ST	03	2 pol. Stiftenleiste geb.	0	0	1	0	00	00	00	00	1.0000
	310	4.260111	1.000	ST	03	4 pol. Stiftenleiste geb.	0	0	1	0	00	00	00	00	1.0000
	315	4.261022	1.000	ST	03	10-pol. Wanne gebogen	0	0	1	0	00	00	00	00	1.0000
	320	4.260062	4.000	ST	03	Federleiste 64 pol. 41612	0	0	1	0	00	00	00	00	4.0000
	325	4.260064	1.000	ST	03	Messerleiste 41612 geb.	0	0	1	0	00	00	00	00	1.0000

Stufe	Pos.	Artikel-Nr.	Menge	ME	Gr	Bezeichnung	Typ	T	D	P	Nr	S1	S2	S3	Bedarf
		3.100144		ST		MK2-5 Printer-Timer AT-6	1								1.0000
	001				01	Stückliste Index -			0						
	002				01	Stand 10.11.87			0						
	003				01	----------			0						
	050	4.490113	1.000	ST	01	Timerprint MK2-5	0	0	1	0	00	00	00	00	1.0000
	051				01	----------			0						
	096				01	Halbleiter			0						
	097				01	----------			0						
	100	4.645014	1.000	ST	01	74HC393 SMD	0	0	1	0	00	00	00	00	1.0000
	101				01	U1			0						
	105	4.645007	1.000	ST	01	74HC138 SMD	0	0	1	0	00	00	00	00	1.0000
	106				01	U2			0						
	110	4.645021	1.000	ST	01	74HC123 SMD	0	0	1	0	00	00	00	00	1.0000
	111				01	U3			0						
	115	4.645002	1.000	ST	01	74HC04 SMD	0	0	1	0	00	00	00	00	1.0000
	116				01	U4			0						
	195				02	----------			0						
	196				02	Widerstände und Potmeter			0						
	197				02	----------			0						
	200	4.715472	1.000	ST	02	Chip 4,7 k Ohm 2% 1206	0	0	1	0	00	00	00	00	1.0000
	201				02	R1			0						
	205	4.715103	2.000	ST	02	Chip 10 k Ohm 2% 1206	0	0	1	0	00	00	00	00	2.0000
	206				02	R2,R3			0						
	210	4.715203	1.000	ST	02	Chip 20 k Ohm 2% 1206	0	0	1	0	00	00	00	00	1.0000
	211				02	R4			0						
	215	4.732203	1.000	ST	02	Potmeter 20 k liegend	0	0	1	0	00	00	00	00	1.0000
	216				02	VR2			0						
	220	4.732503	1.000	ST	02	Potmeter 50 k liegend	0	0	1	0	00	00	00	00	1.0000
	221				02	VR1			0						
	295				03	----------			0						
	296				03	Kondensatoren			0						
	297				03	----------			0						
	300	4.861471	2.000	ST	03	Chip 470 pf 0805	0	0	1	0	00	00	00	00	2.0000
	301				03	C1,C2			0						
	305	4.861273	2.000	ST	03	Chip 27 nf 0805	0	0	1	0	00	00	00	00	2.0000
	306				03	C3,C4			0						
	310	4.845004	2.000	ST	03	Tantal 68uF/6V	0	0	1	0	00	00	00	00	2.0000
	311				03	C5,C6			0						

Stufe	Pos.	Artikel-Nr.	Menge	ME	Gr	Bezeichnung	Typ	T	D	P	Nr	S1	S2	S3	Bedarf
	315	4.861333	1.000	ST	03	Chip 33 nf 0805	0	0	1	0	00	00	00	00	1.0000
	316				03	C7			0						
	395				04	----------			0						
	396				04	Div. Komponenten			0						
	397				04	----------			0						
	405	4.520032	1.000	ST	04	AT-6 Datenkammkabel	0	0	1	0	00	00	00	00	1.0000
	410	4.520033	1.000	ST	04	AT-6 10pol.Interfacekabel	0	0	1	0	00	00	00	00	1.0000

tufe	Pos.	Artikel-Nr.	Menge	ME	Gr	Bezeichnung	Typ	T	D	P	Nr	S1	S2	S3	Bedarf
		3.100145		ST		MK2-6A Powerprint AT-6	1								1.0000
	001				01	Stückliste Index -			0						
	002				01	Stand 19.04.89			0						
	003				01	----------			0						
	044	4.490110	1.000	ST	01	AT-6 Powerprint MK2-6A	0	0	1	0	00	00	00	00	1.0000
	045				01	----------			0						
	046				01	Halbleiter			0						
	047				01	----------			0						
	050	4.670023	1.000	ST	01	79L15 CP	0	0	1	0	00	00	00	00	1.0000
	051				01	U1			0						
	055	4.620019	1.000	ST	01	TSC426CPA	0	0	1	0	00	00	00	00	1.0000
	056				01	U8			0						
	060	4.620021	2.000	ST	01	TSC427CPA	0	0	1	0	00	00	00	00	2.0000
	061				01	U2,U8			0						
	065	4.670015	3.000	ST	01	UC 3524 AN*	0	0	1	0	00	00	00	00	3.0000
	066				01	U3,U9,U12			0						
	070	4.625000	2.000	ST	01	TL 062 CD	0	0	1	0	00	00	00	00	2.0000
	071				01	U4,U10			0						
	075	4.625001	1.000	ST	01	TL064CD	0	0	1	0	00	00	00	00	1.0000
	076				01	U5			0						
	080	4.620011	1.000	ST	01	L297	0	0	1	0	00	00	00	00	1.0000
	081				01	U6			0						
	085	4.620012	1.000	ST	01	L298	0	0	1	0	00	00	00	00	1.0000
	086				01	U7			0						
	090	4.610050	3.000	ST	01	RFP06P08*	0	0	1	0	00	00	00	00	3.0000
	091				01	T1,T3,T18			0						
	095	4.610052	1.000	ST	01	BUZ71A*	0	0	1	0	00	00	00	00	1.0000
	096				01	T8			0						
	100	4.615004	1.000	ST	01	MMBT2907A	0	0	1	0	00	00	00	00	1.0000
	101				01	T12			0						
	105	4.615001	1.000	ST	01	MMBT2222A	0	0	1	0	00	00	00	00	1.0000
	106				01	T15			0						
	110	4.615002	3.000	ST	01	BC 847 B	0	0	1	0	00	00	00	00	3.0000
	111				01	T4,T14,T16			0						
	115	4.615003	3.000	ST	01	BC857B	0	0	1	0	00	00	00	00	3.0000
	116				01	T5,T13,T17			0						
	120	4.610018	1.000	ST	01	TIC116M	0	0	1	0	00	00	00	00	1.0000
	121				01	T2			0						

tufe	Pos.	Artikel-Nr.	Menge	ME	Gr	Bezeichnung	Typ	T	D	P	Nr	S1	S2	S3	Bedarf
	125	4.660007	6.000	ST	01	SB 350	0	0	1	0	00	00	00	00	6.0000
	126				01	D3,D25,GL1 (4x)			0						
	130	4.660016	1.000	ST	01	1N5400	0	0	1	0	00	00	00	00	1.0000
	131				01	D4			0						
	135	4.665002	1.000	ST	01	BAV99	0	0	1	0	00	00	00	00	1.0000
	136				01	D1			0						
	140	4.665003	11.000	ST	01	LL4148F	0	0	1	0	00	00	00	00	11.0000
	141				01	D6,D7,D10,D11,D12,D13,D14			0						
	142				01	D15,D34,D35,D36			0						
	145	4.665103	1.000	ST	01	BZX84C18	0	0	1	0	00	00	00	00	1.0000
	146				01	D16			0						
	150	4.670002	2.000	ST	01	LM 336 Z 5,0V	0	0	1	0	00	00	00	00	2.0000
	151				01	D8,D9			0						
	155	4.660115	1.000	ST	01	1N5339B (5,6V)	0	0	1	0	00	00	00	00	1.0000
	156				01	D33			0						
	160	4.660012	1.000	ST	01	1N4007	0	0	1	0	00	00	00	00	1.0000
	161				01	D5			0						
	165	4.660005	14.000	ST	01	SB 150	0	0	1	0	00	00	00	00	14.0000
	166				01	D2,D17,D18,D19,D20,D21,			0						
	167				01	D22,D23,D24,D26,D27,D28,			0						
	168				01	D29,D32			0						
	195				02	----------			0						
	196				02	Widerstände und Potmeter			0						
	197				02	----------			0						
	200	4.713024	2.000	ST	01	0,1 Ohm 1% 1W	0	0	1	0	00	00	00	00	2.0000
	201				01	R55,R97			0						
	205	4.713023	1.000	ST	02	0,12 Ohm 1% 1W	0	0	1	0	00	00	00	00	1.0000
	206				02	R19			0						
	210	4.713009	1.000	ST	02	0,15 Ohm 1W	0	0	1	0	00	00	00	00	1.0000
	211				02	R68			0						
	220	4.716109	4.000	ST	02	Melf 1 Ohm 1% 0204	0	0	1	0	00	00	00	00	4.0000
	221				02	R56,R57,R58,R59			0						
	222	4.716180	1.000	ST	01	Melf 18 Ohm 0204	0	0	1	0	00	00	00	00	1.0000
	223				01	R81			0						
	225	4.715270	9.000	ST	01	Chip 27 Ohm 2% 1206	0	0	1	0	00	00	00	00	9.0000
	226				01	R16,R18,R61,R62,R69,R74			0						
	227				01	R89,R90,R98			0						
	230	4.715221	2.000	ST	02	Chip 220 Ohm 2% 1206	0	0	1	0	00	00	00	00	2.0000
	231				02	R46,R17			0						

tufe	Pos.	Artikel-Nr.	Menge	ME	Gr	Bezeichnung	Typ	T	D	P	Nr	S1	S2	S3	Bedarf
	235	4.715561	1.000	ST	02	Chip 560 Ohm 2% 1206	0	0	1	0	00	00	00	00	1.0000
	236				02	R38			0						
	240	4.715102	5.000	ST	02	Chip 1 k Ohm 2% 1206	0	0	1	0	00	00	00	00	5.0000
	241				02	R23,R41,R75,R82,R47			0						
	245	4.716202	7.000	ST	02	Melf 2,0 k Ohm 1% 0204	0	0	1	0	00	00	00	00	7.0000
	246				02	R6,R15,R40,R96,R64			0						
	247				02	R92,R94			0						
	250	4.715222	1.000	ST	02	Chip 2,2 k Ohm 2% 1206	0	0	1	0	00	00	00	00	1.0000
	251				02	R10			0						
	255	4.715302	3.000	ST	02	Chip 3 k Ohm 2% 1206	0	0	1	0	00	00	00	00	3.0000
	256				02	R24,R34,R70			0						
	260	4.715332	2.000	ST	02	Chip 3,3 k Ohm 2% 1206	0	0	1	0	00	00	00	00	2.0000
	261				02	R77,R84			0						
	265	4.715432	1.000	ST	02	Chip 4,3 k Ohm 2% 1206	0	0	1	0	00	00	00	00	1.0000
	266				02	R8			0						
	270	4.715472	1.000	ST	02	Chip 4,7 k Ohm 2% 1206	0	0	1	0	00	00	00	00	1.0000
	271				02	R26			0						
	275	4.715512	4.000	ST	02	Chip 5,1 k Ohm 2% 1206	0	0	1	0	00	00	00	00	4.0000
	276				02	R3,R21,R60,R88			0						
	280	4.716752	2.000	ST	02	Melf 7,5 k Ohm 1% 0204	0	0	1	0	00	00	00	00	2.0000
	281				02	R12,R65			0						
	285	4.715103	10.000	ST	02	Chip 10 k Ohm 2% 1206	0	0	1	0	00	00	00	00	10.0000
	286				02	R22,R31,R50,R51,R52,R53			0						
	287				02	R54,R76,R83,R87			0						
	290	4.716113	3.000	ST	02	Melf 11 k Ohm 1% 0204	0	0	1	0	00	00	00	00	3.0000
	291				02	R20,R36,R39			0						
	295	4.716133	2.000	ST	02	Melf 13 k Ohm 1% 0204	0	0	1	0	00	00	00	00	2.0000
	296				02	R43,R67			0						
	300	4.715203	1.000	ST	02	Chip 20 k Ohm 2% 1206	0	0	1	0	00	00	00	00	1.0000
	301				02	R91			0						
	305	4.715243	3.000	ST	02	Chip 24 k Ohm 2% 1206	0	0	1	0	00	00	00	00	3.0000
	306				02	R35,R80,R86			0						
	310	4.715303	1.000	ST	02	Chip 30 k Ohm 2% 1206	0	0	1	0	00	00	00	00	1.0000
	311				02	R25			0						
	315	4.715333	4.000	ST	02	Chip 33 k Ohm 2% 1206	0	0	1	0	00	00	00	00	4.0000
	316				02	R5,R42,R63,R79			0						
	320	4.715683	1.000	ST	02	Chip 68 k Ohm 2% 1206	0	0	1	0	00	00	00	00	1.0000
	321				02	R27			0						
	325	4.716753	2.000	ST	02	Melf 75 k Ohm 1% 0204	0	0	1	0	00	00	00	00	2.0000

;tufe	Pos.	Artikel-Nr.	Menge	ME	Gr	Bezeichnung	Typ	T	D	P	Nr	S1	S2	S3	Bedarf
	326				02	R7,R30			0						
	330	4.715104	2.000	ST	02	Chip 100 k Ohm 2% 1206	0	0	1	0	00	00	00	00	2.0000
	331				02	R4,R49			0						
	335	4.715184	1.000	ST	02	Chip 180 k Ohm 2% 1206	0	0	1	0	00	00	00	00	1.0000
	336				02	R14			0						
	340	4.715334	4.000	ST	02	Chip 330 k Ohm 2% 1206	0	0	1	0	00	00	00	00	4.0000
	341				02	R29,R93,R95,R28			0						
	345	4.715155	2.000	ST	02	Chip 1,5 M Ohm 5% 1206	0	0	1	0	00	00	00	00	2.0000
	346				02	R13,R37			0						
	350	4.713021	1.000	ST	02	ZNR-Widerstand 390V	0	0	1	0	00	00	00	00	1.0000
	351				02	R1			0						
	352				02	4.713020 ZNR für USA 110v			0						
	355	4.713002	1.000	ST	02	82 Ohm NTC-Widerstand	0	0	1	0	00	00	00	00	1.0000
	356				02	R2			0						
	360	4.713004	1.000	ST	02	1k5 NTC-Widerstand	0	0	1	0	00	00	00	00	1.0000
	361				02	R11			0						
	365	4.732102	1.000	ST	02	Potmeter 1 k liegend	0	0	1	0	00	00	00	00	1.0000
	366				02	R9			0						
	370	4.732202	1.000	ST	02	Potmeter 2 k liegend	0	0	1	0	00	00	00	00	1.0000
	371				02	R48			0						
	375	4.716182	1.000	ST	02	Melf 1,8 k 1% 0204	0	0	1	0	00	00	00	00	1.0000
	376				02	R66			0						
	395				03	----------			0						
	396				03	Kondensatoren			0						
	397				03	----------			0						
	400	4.861121	2.000	ST	03	Chip 120 pf 0805	0	0	1	0	00	00	00	00	2.0000
	401				03	C12,C76			0						
	405	4.861331	6.000	ST	03	Chip 330 pf 0805	0	0	1	0	00	00	00	00	6.0000
	406				03	C13,C39,C58,C63,C73,C75			0						
	410	4.861681	3.000	ST	03	Chip 680 pf 0805	0	0	1	0	00	00	00	00	3.0000
	411				03	C17,C41,C77			0						
	415	4.861222	1.000	ST	03	Chip 2,2 nF 0805	0	0	1	0	00	00	00	00	1.0000
	416				03	C14			0						
	420	4.861392	1.000	ST	03	Chip 3,9 nF 0805	0	0	1	0	00	00	00	00	1.0000
	421				03	C44			0						
	425	4.861562	1.000	ST	03	Chip 5,6 nF 0805	0	0	1	0	00	00	00	00	1.0000
	426				03	C35			0						
	430	4.861103	5.000	ST	03	Chip 10 nf 0805	0	0	1	0	00	00	00	00	5.0000
	431				03	C7,C23,C33,C38,C80			0						

tufe	Pos.	Artikel-Nr.	Menge	ME	Gr	Bezeichnung	Typ	T	D	P	Nr	S1	S2	S3	Bedarf
	435	4.861333	1.000	ST	03	Chip 33 nf 0805	0	0	1	0	00	00	00	00	1.0000
	436				03	C45			0						
	440	4.861154	27.000	ST	03	Chip 150 nf	0	0	1	0	00	00	00	00	27.0000
	441				03	C2,C3,C5,C8,C11,C16,C19			0						
	442				03	C20,C21,C24,C25,C29,C32			0						
	443				03	C37,C42,C48,C81,C84,C60			0						
	444				03	C61,C65,C66,C69,C70,C71			0						
	445				03	C78,C49			0						
	450	4.820007	14.000	ST	03	Elko 10 uF/50V stehend	0	0	1	0	00	00	00	00	14.0000
	451				03	C15,C18,C22,C30,C31,C36			0						
	452				03	C40,C43,C62,C67,C68,C74			0						
	453				03	C79,C28			0						
	455	4.820011	1.000	ST	03	Elko 100 uF/35V stehend	0	0	1	0	00	00	00	00	1.0000
	456				03	C55			0						
	460	4.820012	1.000	ST	03	Elko 100 uF/35V stehend	0	0	1	0	00	00	00	00	1.0000
	461				03	C4			0						
	465	4.821004	12.000	ST	03	HF-Elko 470uF/16V stehend	0	0	1	0	00	00	00	00	12.0000
	466				03	C9,C10,C26,C27,C34,C46			0						
	467				03	C47,C56,C57,C82,C83,C4			0						
	470	4.830010	3.000	ST	03	Elko 6800uF/16V axial	0	0	1	0	00	00	00	00	3.0000
	471				03	C50,C51,C53			0						
	475	4.830009	1.000	ST	03	Elko 2200uF/40V axial	0	0	1	0	00	00	00	00	1.0000
	476				03	C1			0						
	495				04	----------			0						
	496				04	InduktivitÄten			0						
	497				04	----------			0						
	505	4.320030	1.000	ST	04	Ringkern bew. 500 uH	1	0	1	0	00	00	00	00	1.0000
	506				04	L3			0						
	510	4.320029	3.000	ST	04	Lineardrossel 300 uH	0	0	1	0	00	00	00	00	3.0000
	511				04	L1,L4,L10			0						
	515	4.320033	2.000	ST	01	Ringkern bew. 1x38 Wdg	1	0	1	0	00	00	00	00	2.0000
	516				01	L5,L11			0						
	520	4.320046	2.000	ST	04	Drossel 100 uH	0	0	1	0	00	00	00	00	2.0000
	521				04	L8,L9			0						
	525	4.320021	1.000	ST	04	Drossel DL01-24-4,5-0,05	0	0	1	0	00	00	00	00	1.0000
	526				04	L7			0						
	530	4.320045	2.000	ST	04	Breitbanddrossel 1,5 Wdg	0	0	1	0	00	00	00	00	2.0000
	531				04	L2,L7			0						
	535	4.320055	1.000	ST	04	DÄmpfungsperle	0	0	1	0	00	00	00	00	1.0000

Stufe	Pos.	Artikel-Nr.	Menge	ME	Gr	Bezeichnung	Typ	T	D	P	Nr	S1	S2	S3	Bedarf
	536				04	L12			0						
	595				05	----------			0						
	596				05	Div. Komponenten			0						
	597				05	----------			0						
	600	4.260145	4.000	ST	05	1 pol Stiftenleiste gerad	0	0	1	0	00	00	00	00	4.0000
	605	4.260143	1.000	ST	05	5 pol Stiftenleiste gerad	0	0	1	0	00	00	00	00	1.0000
	610	4.260076	16.000	ST	05	Steckzunge 2,8/0,8 mm	0	0	1	0	00	00	00	00	16.0000
	615	4.260062	1.000	ST	05	Federleiste 64 pol. 41612	0	0	1	0	00	00	00	00	1.0000
	620	4.260026	2.000	ST	05	Molex Buchse	0	0	1	0	00	00	00	00	2.0000
	625	4.260028	1.000	ST	05	2 pol. Buchsenhalter	0	0	1	0	00	00	00	00	1.0000
	630	4.210050	1.000	ST	05	Sicherungshalter 031.8001	0	0	1	0	00	00	00	00	1.0000
	635	4.210009	1.000	ST	05	Sicherung 1,25 AF	0	0	1	0	00	00	00	00	1.0000
	640	4.240000	4.000	ST	05	Kühlkörper PR 17/15	0	0	1	0	00	00	00	00	4.0000
	641				05	T1,T3,T8,T18			0						
	645	4.910011	4.000	ST	05	Kreuzschlitzschr. M2.5x8	0	0	1	0	00	00	00	00	4.0000
	650	4.920002	4.000	ST	05	Mutter M 2,5 (d=0,5)	0	0	1	0	00	00	00	00	4.0000
	655	4.530007	5.000	ST	01	Kabelbinder 100 mm	0	0	1	0	00	00	00	00	5.0000
	660	4.930029	4.000	ST	01	Fächerscheibe M2,6	0	0	1	0	00	00	00	00	4.0000
	665	4.530004	0.020	M	01	Schrumpfschl. 12mm sw	0	0	1	0	00	00	00	00	0.0200
	900				09	----------			0						
	901				09	Änderungen + Bemerkungen			0						
	902				09	----------			0						
	903				09	13.04.87 (RS)			0						
	904				09	R66 alt 2k, neu 1k8			0						
	905				09	----------			0						
	906				09	29.07.87			0						
	907				09	C1 2200uF/40V Nachtrag			0						
	908				09	Fächerscheiben M2,6			0						
	909				09	----------			0						
	910				09	04.01.88 (KO)			0						
	911				09	Umstellung Lager 75k neu			0						
	912				09	Melf 1%			0						
	913				09	----------			0						
	914				01	13.01.1989 BM			0						
	915				01	R81 alt 27 Ohm neu 18 Ohm			0						
	916				01	----------			0						
	917				01	19.04.89 BM			0						
	918				01	Anpassung an SP-300			0						
	919				01	R97 alt 0,22 neu 0,1 Ohm			0						

Stufe	Pos.	Artikel-Nr.	Menge	ME	Gr	Bezeichnung	Typ	T	D	P	Nr	S1	S2	S3	Bedarf
	920				01	L11 alt 800uH neu 100uH			0						
	921				01	----------			0						

Stufe	Pos.	Artikel-Nr.	Menge	ME	Gr	Bezeichnung	Typ	T	D	P	Nr	S1	S2	S3	Bedarf
		3.100220		ST		MK 2-92 Spiro stand-alone	1								1.0000
	001				01	Stückliste Index -			0						
	002				01	Stand 14.12.88			0						
	003				01	----------			0						
	050	4.490159	1.000	ST	01	Print MK2-92	0	0	1	0	00	00	00	00	1.0000
	097				01	----------			0						
	098				01	Halbleiter			0						
	099				01	----------			0						
	100	4.640011	1.000	ST	01	74HC259	0	0	1	0	00	00	00	00	1.0000
	101				01	U1			0						
	105	4.650031	1.000	ST	01	PAL SCHILLER 002	0	0	1	0	00	00	00	00	1.0000
	106				01	U2			0						
	110	4.640022	1.000	ST	01	74HC257	0	0	1	0	00	00	00	00	1.0000
	111				01	U3			0						
	197				01	----------			0						
	198				01	Widerstände			0						
	199				01	----------			0						
	200	4.711103	1.000	ST	01	10K 1/4W 1%	0	0	1	0	00	00	00	00	1.0000
	201				01	R1			0						
	297				01	----------			0						
	298				01	Kondensatoren			0						
	299				01	----------			0						
	300	4.830003	3.000	ST	01	Elko 220uF/16V axial	0	0	1	0	00	00	00	00	3.0000
	301				01	C1,C2,C3			0						
	305	4.812080	5.000	ST	01	100nF/63V/10% Vielschicht	0	0	1	0	00	00	00	00	5.0000
	306				01	C4,C5,C6,C7,C8			0						
	397				01	----------			0						
	398				01	Div. Komponenten			0						
	399				01	----------			0						
	400	4.260064	1.000	ST	01	Messerleiste 41612 geb.	0	0	1	0	00	00	00	00	1.0000
	405	4.260191	1.000	ST	01	D-Stecker 25p abgw wb kpt	0	0	1	0	00	00	00	00	1.0000
	420	4.910007	2.000	ST	01	Kreuzschlitzschr. M3x8	0	0	1	0	00	00	00	00	2.0000
	425	4.920003	2.000	ST	01	Mutter M3 (d=0,5)	0	0	1	0	00	00	00	00	2.0000
	430	4.930030	2.000	ST	01	Fächerscheibe M3	0	0	1	0	00	00	00	00	2.0000
	435	4.917000	2.000	ST	01	Linsenk.schraube 2,9x6,5	0	0	1	0	00	00	00	00	2.0000
	436				01	für Stecker ST1			0						

Stufe	Pos.	Artikel-Nr.	Menge	ME	Gr	Bezeichnung	Typ	T	D	P	Nr	S1	S2	S3	Bedarf
		3.100217		ST		MK2-91 (RS, Spiro)	1								1.0000
	001				01	StUckliste Index -			0						
	002				01	Stand 03.12.88			0						
	003				01	----------			0						
	050	4.490107	1.000	ST	01	Print MK 2-91	0	0	1	0	00	00	00	00	1.0000
	097				01	----------			0						
	098				01	Halbleiter			0						
	099				01	----------			0						
	100	4.645011	1.000	ST	01	74HC257 SMD	0	0	1	0	00	00	00	00	1.0000
	101				01	U16			0						
	105	4.650042	1.000	ST	01	EXO 3C 19,6608 MHz	0	0	1	0	00	00	00	00	1.0000
	106				01	U14			0						
	110	4.645012	1.000	ST	01	74HC259 SMD	0	0	1	0	00	00	00	00	1.0000
	111				01	U15			0						
	115	4.650031	1.000	ST	01	PAL SCHILLER 002	0	0	1	0	00	00	00	00	1.0000
	116				01	U17			0						
	120	4.655017	1.000	ST	01	MB 89371 QFP	0	0	1	0	00	00	00	00	1.0000
	121				01	U18			0						
	125	4.635016	2.000	ST	01	MC 145406 DW	0	0	1	0	00	00	00	00	2.0000
	126				01	U19,U20			0						
	197				01	----------			0						
	198				01	Kondensatoren			0						
	199				01	----------			0						
	200	4.825003	2.000	ST	01	Elko 47uF/16V SMD	0	0	1	0	00	00	00	00	2.0000
	201				01	C1,C3			0						
	205	4.825005	1.000	ST	01	Elko 100uF/6,3V SMD	0	0	1	0	00	00	00	00	1.0000
	206				01	C2			0						
	210	4.861473	8.000	ST	01	Chip 47 nf 0805	0	0	1	0	00	00	00	00	8.0000
	211				01	C4,C5,C6,C9,C16,C17,C25			0						
	212				01	C26			0						
	297				01	----------			0						
	298				01	WiderstÄnde			0						
	299				01	----------			0						
	300	4.715103	1.000	ST	01	Chip 10 k Ohm 2% 1206	0	0	0	1	00	00	00	00	1.0000
	301				01	R3			0						
	397				01	----------			0						
	398				01	Div. Komponenten			0						
	399				01	----------			0						

Stufe	Pos.	Artikel-Nr.	Menge	ME	Gr	Bezeichnung	Typ	T	D	P	Nr	S1	S2	S3	Bedarf
	400	4.260055	2.000	ST	01	D-Steckerbolzen m.Mutter	0	0	1	0	00	00	00	00	2.0000
	405	4.260064	1.000	ST	01	Messerleiste 41612 geb.	0	0	1	0	00	00	00	00	1.0000
	406				01	ST1			0						
	415	4.260046	1.000	ST	01	25 pol.D-Stecker abgw.wb.	0	0	1	0	00	00	00	00	1.0000
	416				01	ST3			0						
	420	4.260052	1.000	ST	01	25 pol. Kunststoffwinkel	0	0	1	0	00	00	00	00	1.0000
	425	4.910007	2.000	ST	01	Kreuzschlitzschr. M3x8	0	0	1	0	00	00	00	00	2.0000
	430	4.920003	2.000	ST	01	Mutter M3 (d=0,5)	0	0	1	0	00	00	00	00	2.0000
	435	4.930030	2.000	ST	01	Fächerscheibe M3	0	0	1	0	00	00	00	00	2.0000
	440	4.917000	2.000	ST	01	Linsenk.schraube 2,9x6,5	0	0	1	0	00	00	00	00	2.0000
	441				01	für ST1			0						
	465	4.430054	1.000	ST	01	Distanzsäule 12mm 1i/1a	0	0	1	0	00	00	00	00	1.0000

01 SCHILLER AG B A U K A S T E N - S T U E C K L I S T E KO /0374/645/25.04.89/

Stufe	Pos.	Artikel-Nr.	Menge	ME	Gr	Bezeichnung	Typ	T	D	P	Nr	S1	S2	S3	Bedarf
		3.100216		ST		MK2-91 (Video RS Spiro)	1								1.0000
	001				01	Stückliste Index -			0						
	002				01	Stand 03.12.1988			0						
	003				01	----------			0						
	050	4.490107	1.000	ST	01	Print MK 2-91	0	0	1	0	00	00	00	00	1.0000
	097				01	----------			0						
	098				01	Halbleiter			0						
	099				01	----------			0						
	100	4.650025	1.000	ST	01	HD 63484UP-8	0	0	1	0	00	00	00	00	1.0000
	101				01	U1			0						
	105	4.650030	1.000	ST	01	PAL SCHILLER 001	0	0	1	0	00	00	00	00	1.0000
	106				01	U2			0						
	110	4.645022	1.000	ST	01	74HC564 SMD	0	0	1	0	00	00	00	00	1.0000
	111				01	U3			0						
	115	4.645011	3.000	ST	01	74HC257 SMD	0	0	1	0	00	00	00	00	3.0000
	116				01	U4,U5,U16			0						
	120	4.655005	4.000	ST	01	TMS4464-15FML	0	0	1	0	00	00	00	00	4.0000
	121				01	U6,U7,U8,U9			0						
	125	4.645019	2.000	ST	01	74HC166 SMD	0	0	1	0	00	00	00	00	2.0000
	126				01	U10,U11			0						
	130	4.645050	2.000	ST	01	74AC04 SMD	0	0	1	0	00	00	00	00	2.0000
	131				01	U12,U13			0						
	135	4.650042	1.000	ST	01	EXO 3C 19,6608 MHz	0	0	1	0	00	00	00	00	1.0000
	136				01	U14			0						
	140	4.645012	1.000	ST	01	74HC259 SMD	0	0	1	0	00	00	00	00	1.0000
	141				01	U15			0						
	145	4.650031	1.000	ST	01	PAL SCHILLER 002	0	0	1	0	00	00	00	00	1.0000
	146				01	U17			0						
	150	4.655017	1.000	ST	01	MB 89371 QFP	0	0	1	0	00	00	00	00	1.0000
	151				01	U18			0						
	155	4.635016	2.000	ST	01	MC 145406 DW	0	0	1	0	00	00	00	00	2.0000
	156				01	U19,U20			0						
	197				01	----------			0						
	198				01	Kondensatoren			0						
	199				01	----------			0						
	200	4.825003	2.000	ST	01	Elko 47uF/16V SMD	0	0	1	0	00	00	00	00	2.0000
	201				01	C1,C3			0						
	205	4.825005	1.000	ST	01	Elko 100uF/6,3V SMD	0	0	1	0	00	00	00	00	1.0000

Stufe	Pos.	Artikel-Nr.	Menge	ME	Gr	Bezeichnung	Typ	T	D	P	Nr	S1	S2	S3	Bedarf
	206				01	C2			0						
	210	4.861473	22.000	ST	01	Chip 47 nf 0805	0	0	1	0	00	00	00	00	22.0000
	211				01	C4,C5,C6,C9,C10,C11,C12			0						
	212				01	C13,C14,C15,C16,C17,C18			0						
	213				01	C19,C20,C21,C22,C23,C24			0						
	214				01	C25,C26,C27			0						
	215	4.861470	1.000	ST	01	Chip 47 pF 0805	0	0	1	0	00	00	00	00	1.0000
	216				01	C8			0						
	220	4.861330	1.000	ST	01	Chip 33 pf 0805	0	0	1	0	00	00	00	00	1.0000
	221				01	C7			0						
	297				01	----------			0						
	298				01	WiderstÄnde			0						
	299				01	----------			0						
	300	4.715102	1.000	ST	01	Chip 1 k Ohm 2% 1206	0	0	1	0	00	00	00	00	1.0000
	301				01	R1			0						
	305	4.715221	1.000	ST	01	Chip 220 Ohm 2% 1206	0	0	1	0	00	00	00	00	1.0000
	306				01	R2			0						
	310	4.715103	1.000	ST	01	Chip 10 k Ohm 2% 1206	0	0	1	0	00	00	00	00	1.0000
	311				01	R3			0						
	397				01	----------			0						
	398				01	Div. Komponenten			0						
	399				01	----------			0						
	400	4.260055	2.000	ST	01	D-Steckerbolzen m.Mutter	0	0	1	0	00	00	00	00	2.0000
	405	4.260064	1.000	ST	01	Messerleiste 41612 geb.	0	0	1	0	00	00	00	00	1.0000
	406				01	ST1			0						
	410	4.260070	1.000	ST	01	9 pol. D-Stecker abg.weib	0	0	1	0	00	00	00	00	1.0000
	411				01	ST2			0						
	415	4.260191	1.000	ST	01	D-Stecker 25p abgw wb kpt	0	0	1	0	00	00	00	00	1.0000
	416				01	ST3			0						
	420	4.260071	1.000	ST	01	9 pol.Kunststoffwinkel	0	0	1	0	00	00	00	00	1.0000
	435	4.910007	4.000	ST	01	Kreuzschlitzschr. M3x8	0	0	1	0	00	00	00	00	4.0000
	440	4.920003	4.000	ST	01	Mutter M3 (d=0,5)	0	0	1	0	00	00	00	00	4.0000
	445	4.930030	4.000	ST	01	FÄcherscheibe M3	0	0	1	0	00	00	00	00	4.0000
	450	4.250009	1.000	ST	01	IC-Sockel 64 pol.	0	0	1	0	00	00	00	00	1.0000
	455	4.917000	2.000	ST	01	Linsenk.schraube 2,9x6,5	0	0	1	0	00	00	00	00	2.0000
	460	4.530010	1.000	ST	01	Kabelbinder 300 mm	0	0	1	0	00	00	00	00	1.0000
	465	4.430054	1.000	ST	01	DistanzsÄule 12mm 1i/1a	0	0	1	0	00	00	00	00	1.0000

Proposed Spares for CARDIOVIT AT-6

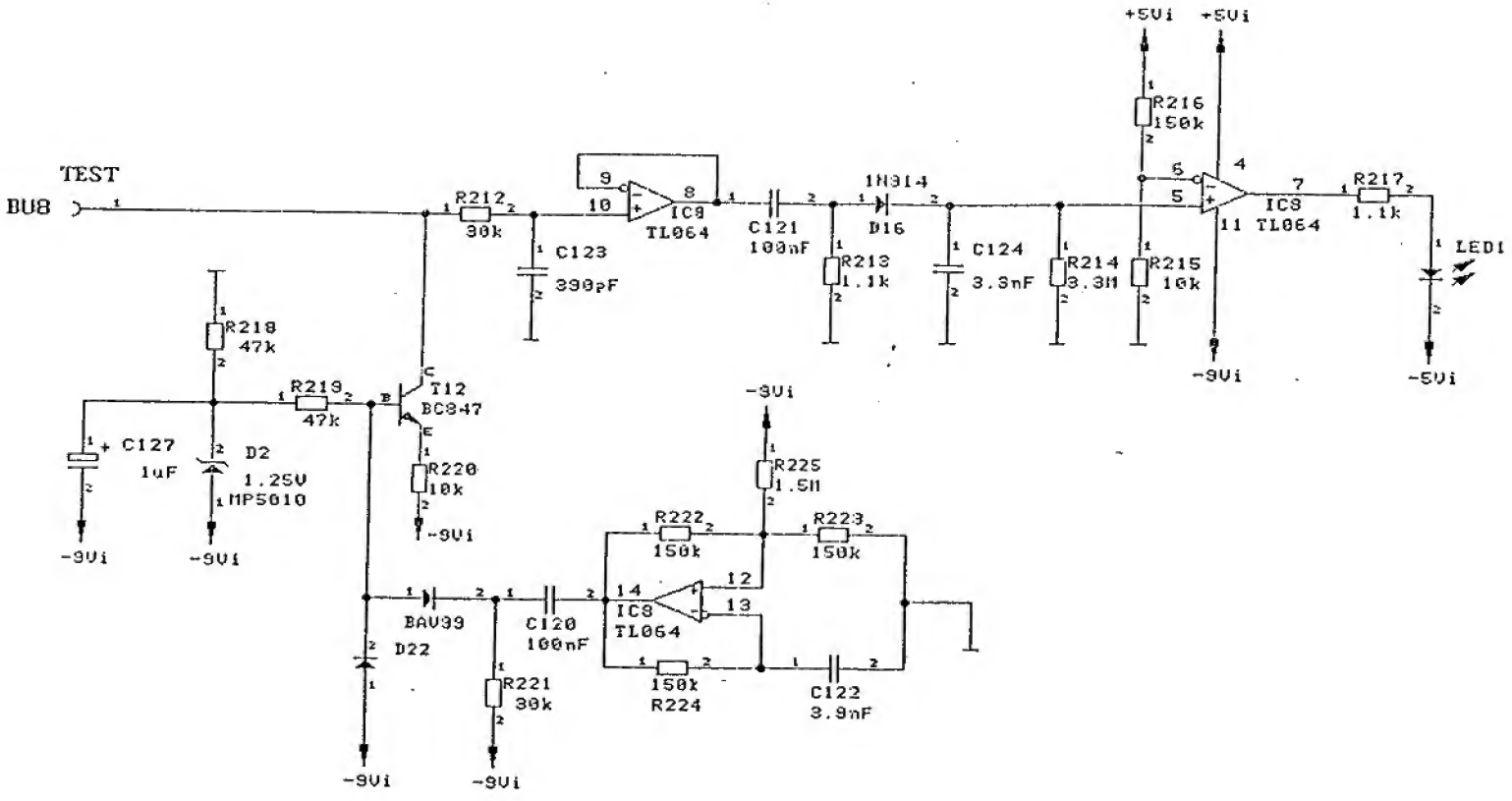
AT-6 µPCB	3.100225	(NON-EXEC, Standard)
AT-6 µPCB	3.100230	(EXEC, Std.)
SP-200 µPCB ?	3.100229	(Spirometry µPcb)
ECG amplifier	3.100260	
Power supply PCB	3.100145	
AT-6 Spiro stand-alone	3.100220	(Extension Pcb)
AT-6 Spiro/RS-232	3.100217	(Extension Pcb)
AT-6 Spiro/RS-232/Vid	3.100216	(Extension Pcb)
AT-6 Keyboard	3.100142	(complete assy.)
Lead Acid accumulator	4.350005	
240 Vac power transf.	4.320084	(240 Vac type)
AT-6 LCD display	3.900516	(not compat. with AT-3 LCD !)
LCD Plexi-prot.cover	4.435003	
Paper breaking edge	4.415013	(anodized edge plate)
Paper drive cylinder	4.410018	(complete assy.)
Paper drive bearing	4.410041	(2/unit)
Paper table	3.900500	(complete assy.)
Side mask plate	4.450023	(AT-6 standard side plate)
Side mask plate	4.450025	(With RS-232/Spiro orifice)
Side mask plate	4.450032	(SP-200 & RS-232)

? = depending on need and number of units sold

SECTION 10

CIRCUIT UPDATE INFORMATION

	Drawing No.
Cable Tester	1200201



SCHILLER AG, CH-6340 BAAR ALTGASSE 68			
TITLE: EKG AMPLIFIER MK1-2A CABLE TESTER			
SIZE: B	CODE:	NUMBER: 1200201 A5	REV: A
DATE: 06.06.1995			